SELECTED

SESOURCESABSTRACTS



VOLUME 7, NUMBER 9 MAY 1, 1974 SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

SELECTED WATER RESOURCES ABSTRACTS is available to Federal agencies, contractors, or grantees in water resources upon request to: Manager, Water Resources Scientific Information Center, Office of Water Resources Research, U.S. Department of the Interior, Washington, D. C. 20240.

SELECTED WATER RESOURCES ABSTRACTS is also available on subscription from the National Technical Information Service. Annual subscription is \$45 (domestic), \$56.25 (foreign). Certain documents abstracted in this journal can be purchased from the NTIS at prices indicated in the entry. Prepayment is required.

SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Resources Research, U.S. Department of the Interior



VOLUME 7, NUMBER 9 MAY 1, 1974

W74-04301 -- W74-04850

The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the Water Resources Thesaurus. Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCU-MENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center Office of Water Resources Research U.S. Department of the Interior Washington, D. C. 20240

CONTENTS

	٠.
FOREWORD	11
I ONLWOND	.,

SUBJECT FIELDS AND GROUPS

(Use Edge Index on back cover to Locate Subject Fields and Indexes in the journal.)

01 NATURE OF WATER

Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE

Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION

Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL

Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Non-Water Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION

Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration: Water Quality Control.

06 WATER RESOURCES PLANNING

Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA

Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS

Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS, AND FACILITIES

Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION

Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1A. Properties

VISCOSITY MEASUREMENTS OF WATER IN REGION OF ITS MAXIMUM DENSITY, Department of the Environment, Ottawa (Ontario). Inland Waters Directorate. For primary bibliographic entry see Field 2K. W74-04518

2. WATER CYCLE

2A. General

A THREE-DIMENSIONAL MODEL FOR ESTUARIES AND COASTAL SEAS: VOLUME I, PRINCIPLES OF COMPUTATION, For primary bibliographic entry see Field 2L. W74-04301 RAND Corp., Santa Monica, Calif.

HYDROLOGY OF THE CENTRAL ARCTIC RIVER BASINS OF ALASKA, Alaska Univ., College. Inst. of Water Resources. D. L. Kane, and R. F. Carlson.

D.L. Kane, and R. F. Carison. Available from National Technical Information Service as PB-228 011 \$3.75 in paper copy, \$1.45 in microfiche. Report No. IWR-41, December, 1973. 51 p, 14 fig, 5 tab. OWRR A-031-ALAS(6).

Descriptors: Hydrology, Runoff, *Precipitation(Atmospheric), Evapotranspiration, *Arctic, *Alaska, Permafrost, *River basins, Snow, *Streamflow, Evaporation, Hydrologic

In 1969, a study of the water resources of Alaska's Arctic was initiated in response to the area's large scale petroleum exploration and extraction activities. A summary of the work is presented through a discussion of the basic features of the hydrologic system; the physical system, climatic input, and hydrologic output, with particular emphasis given to the Kuparuk, the Sagavanirktok, and the Putuligayuk Rivers. Precipitation acts as the controlling input function for the overall system. It occurs as snowfall in the eight winter months and as rainfall in June, July, August, and most of September. Comparison of precipitation records are made for Barrow, Barter Island and Prudhoe Bay. Other input variables which were examined are solar radiation, wind speed, and temperature. The output variables of the hydrologic system are evaporation and streamflow. Streamflow values collected by the U.S. Geological Survey for a two to three year period for the Putuligayuk, the Kuparuk, the Sagavanirktok Rivers indicate peak parus, the Sagavanirktok Rivers indicate peak values and approximate summer mean values of 25, 20 and 20 cfs/mi2 and .01, 0.1, 1.0 cfs/mi2 respectively. The streamflow begins with a precipitous rise at the beginning of June and recedes to a sustained amount for the remainder of recedes to a sustained amount for the remainder or the summer until September after which the winter flow becomes nearly negligible. The most severe restriction on hydrologic studies in this and other arctic areas is the lack of long term data. W74-04304

A DETAILED INVESTIGATION OF THE SOCIOLOGICAL, ECONOMIC, AND ECOLOGICAL ASPECTS OF PROPOSED RESERVOIR SITES IN THE SALT RIVER BASIN OF KEN-

TUCKY,
Kentucky Water Resources Inst., Lexington.
S. E. Neff, L. A. Krumholz, J. R. Baker, D. E.
Jennings, and A. C. Miller.
Available from National Technical Information.
Decision 50, 23, 26 in capper copy. \$1.45 in

Service as PB-227 920 \$3.75 in paper copy, \$1.45 in microfiche. Research Report No 67, 1973. 64 p, 2

fig, 6 tab, 18 ref. OWRR B-022-KY(1). 14-31-0001-

Descriptors: *Kentucky, *Reservoir sites, *Pre-impoundment, *Benthos, Fish, *Aquatic habitats, Limnology, *Water quality, Environmental ef-fects, Natural resources, Benefits, Planning, Population, *Social adjustment, Economics, Sulfates, Phosphates, Alkalinity, Hard-ness(Water), Turbidity, Specific conductivity, Mussels, Coddisflies, Drift. Identifiers: *Salt River basin(Ky.).

Samples of water, bottom fauna, and fishes were collected from 66 stations in the Salt River and one of its principal tributaries, the Beech Fork and its tributary the Chaplin River, Kentucky. Precipitation ranged from 38.86 inches (1969) to 58.04 inches (1970), an increase of nearly 50 percent with marked fluctuations in discharge. Intensive comparisons of phosphates, sulfates, specific con-ductance, total alkalinity, total hardness, and turbidity showed the streams to be relatively clean and healthy. Nearly 300 different kinds of benthic organisms and other macroinvertebrates have been collected and identified from the basin. Detailed studies of caddisflies and stream drift are under way along with the development of com-puter programs for diversity indices of the various organisms. Twenty-eight species of bite various organisms. Twenty-eight species of bitwalve mussels and representatives of six genera of snails have been collected including the Asiatic clam Corbicula mulleri. Among the vertebrates, 60 species of fishes have been collected and identified cles of tishes have been collected and identified along with 22 amphibians and 21 reptiles. Nearly 150 species of birds have been identified in the area. An economic study of Spencer County revealed that there has been a decrease in the human population along with a general decline in the overall economic picture of the county as indicated by a retarded rate of growth in annual per cataged by a retarded rate of growth in annual per capita income and a decline in total retail sales within the county over the past decade. The highway system in the county consists largely of Class 4,5, and 6 roads whic, because of the topog-raphy, are generally narrow, crooked, and hilly. (Grieves-Kentucky) W74-04310

A REVIEW OF OCEANOGRAPHIC VARIA-BLES AND THEIR ANALYSES AND PREDIC-TIONS OVER THE CONTINENTAL SHELF, Fleet Numerical Weather Facility, Monterey,

For primary bibliographic entry see Field 2L. W74-04329

RECHARGE OF A CENTRAL ALASKA LAKE BY SUBPERMAFROST GROUNDWATER. Alaska Univ., College.

For primary bibliographic entry see Field 2F. W74-04394

STATISTICAL ANALYSIS OF HYDROGRAPH CHARACTERISTICS FOR SMALL URBAN

WATERSHEDS,
Tracor, Inc., Austin, Tex.
D. W. Hamm, C. W. Morgan, and H. A. Reeder.
Available from the National Technical Information Service as PB-228 131, \$5.00 in paper copy,
\$1.45 in microfiche. Completion Report Document

Number T73-AU-9559-U, October 1973. 155 p, 10 fig, 13 tab, 4 ref, 3 append. OWRR C-3286 (No

Descriptors: *Unit hydrographs, *Synthetic *Rainfall-runoff relationships, hydrographs, nydrographs, "Rainfail-runoff relationsings," Precipitation excess, Channel improvement, Peak discharge, Storm runoff, Equations, "Statistical models, Model studies, Regression analysis, Small watersheds, Watersheds(Basins). Identifiers: "Urban watersheds, Confidence limits, Nomograms, Impervious cover, Time of rise, Correlation coefficient.

The purpose was to obtain equations which predict the 30-minute unit hydrograph for small urban watersheds. Equations were derived for models of the product form that correlate basin topographical features with hydrographic parameters. The models were transformed by natural logarithms so that linear regression methods could be used to ob-tain estimates of the exponents in the equations. The equations were applied to a wide variety of watersheds to demonstrate their validity. Confidence intervals were derived for the estimation of each hydrographic parameter. Nomograms were supplied to provide fast and accurate solutions for each equation.

W74-04459

PREDICTION OF THE 1972 MANAGUA, NICARAGUA, EARTHQUAKE FROM GROUNDWATER CHANGES, INFERRED PROBABILITY OF EARTHQUAKES IN THE CITY OF MANAGUA, NICARAGUA, DURING THE SUMMER OF 1973, Santos and Heilemann, Managua (Nicaragua).

For primary bibliographic entry see Field 2F. W74-04467

LINEAR SYSTEMS TECHNIQUE APPLIED TO HYDROLOGIC DATA ANALYSIS AND IN-STRUMENT EVALUATION: A CASE STUDY ON DATA FROM THE ALICE SPRINGS AREA, Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land

Organization, Canderia (viastana).

P. S. Eagleson, and M. J. Goodspeed.

Available from NTIS, Springfield, Va. 22151 PB-223 330 Price \$5.25 printed copy; \$1.45 microfiche.

Technical Paper No 34, 1973. 60 p, 39 fig, 10 tab,

27 ref, append

Descriptors: *Systems analysis, *Instrumentation, Descriptors: "Systems analysis, "Instrumentation," Rainfall-runoff relationships, "Australia, Frequency analysis, Stream gages, Rain gages, Hydrograph analysis, Data collections, Network design, "Hydrologic data. Identifiers: *Linear systems analysis, Spectral analysis.

Methods of linear systems analysis were applied to questions of instrumentation adequacy and rain-fall-runoff relations for a network of experimental catchments in the Alice Springs area, Australia. The methods used are given in detail. Sufficient data are not yet available for more than tentative conclusions to be drawn regarding rainfall-runoff relations. It is concluded that the instrumentation is adequate in performance for the purpose intended. Applicability of the techniques to other situations is discussed. (Knapp-USGS) W74-04470

INTERNATIONAL DECADE OF OCEAN EX-PLORATION.

National Science Foundation, Washington, D.C. Office for the International Decade of Ocean Exploration. For primary bibliographic entry see Field 6E. W74-04473

TOPOLOGY OF RIVER SYSTEMS AND HYDROGRAPHIC INDICATOR STUDIES (TOPOLOGIYA RECHNYKH SISTEM I GIDROGRAFICHESKIYE INDIKATSIONNYYE ISSLEOVANIYA), I. N. Gartsman.

Vodnyye Resursy, No 3, p 109-124, 1973. 2 fig, 1 tab, 34 ref.

Pescriptors: "Geomorphology, "To "River systems, "Drainage "Hydrography, Systems analysis, models, Equations. Identifiers: "USSR. Descriptors: *Geomorphology, *Topography, *River systems, *Drainage systems, Statistical

Group 2A-General

Basing hydrography on a systems approach to a river network is an effective scientific method of study. The history of development of the systems approach under the impetus supplied by Horton is reviewed, and ways are indicated for further improvement of topological analysis of river systems through formulation of dynamic models. Emphasis is placed on the need for a separate study of the drainage and transport systems of a river network. (Josefson-USGS) W74-04578

HYDROLOGIC INVESTIGATION AND DESIGN

IN URBAN AREAS--A REVIEW, Snowy Mountains Engineering Corp., Cooma (Australia).

A. P. Aitken.

Australian Water Resources Council Technical Paper No 5 1973. 79 p, 9 fig, 11 tab, 10 append. Research Project 71/21.

*Urban hydrology, Descriptors: *Reviews, Research and development, Data collections, Rainfall-runoff relationships, Urban runoff, Urbanization, Gaging, Urban drainage, Rational formula

Urban hydrologic practices and research in Australia, United States of America, France, and the United Kingdom are reviewed. It is recommended that a deterministic mathematical model for urban catchments in Australia be developed, that a program involving the collection and analysis of rainfall, runoff, and water quality data in Australian cities be implemented, and that an Australian urban hydrology manual be compiled. The Ra-tional Formula is most commonly used for computing flood discharges in Australia, but the coefficient of runoff cannot be objectively determined for any locality because of lack of data. The Road Research Laboratory (RRL) Hydrograph Model has been used for some catchments but is unsuitable in many localities and has not been tested sufficiently in others. Only in the United Kingdom, where it appears the RRL Hydrograph Model has gained wide acceptance, has there been a significant departure from traditional methods. Deterministic mathematical models have been developed in the United States of America, and these models have already been applied to some urban catchments. Research is being carried out on development of better instruments for recording rainfall, discharge, and water quality. In addition, research into the effect of urbanization on the environment is sponsored. A significant amount of current research in urban hydrology in the United States is related to solving water pollution problems. (Knapp-USGS) W74-04597

THE WATER BALANCE IN ARCTIC AND SUB-ARCTIC REGIONS--ANNOTATED BIBLIOG-RAPHY AND PRELIMINARY ASSESSMENT, Cold Regions Research and Engineering Lab., Hanover, N.H. or primary bibliographic entry see Field 2C. W74-04601

2B. Precipitation

HURRICANE STORM SURGE CONSIDERED AS A RESONANCE PHENOMENON, Waterloopkundig Laboratorium Laboratorium. (Netherlands) For primary bibliographic entry see Field 2L. W74-04332

HURRICANE TIDE PREDICTION FOR NEW

YORK BAY, Texas A and M Univ., College Station. Dept. of Oceanography and Meteorology. For primary bibliographic entry see Field 2L.

TRANS.PACIFIC FALLOUT AND PROTEC-TIVE COUNTERMEASURES, Oak Ridge National Lab., Oak Ridge, Tenn. For primary bibliographic entry see Field 5B.

WORLD DESERTIFICATION: CAUSE AND EF-FECT. A LITERATURE REVIEW AND AN-NOTATED BIBLIOGRAPHY,

W74-04454

Arizona Univ., Tucson. Office of Arid Lands Stu-For primary bibliographic entry see Field 3B.

SUMMARY REPORT OF METROMEX STU-DIES, 1971-1972.

Dies, 1971-1972. Illinois State Water Survey, Urbana. Report of Investigation 74. 1973. Floyd A. Huff, editor. 169 p. 104 fig, 46 tab, 71 ref. NSF-GA-28189X, GI-33371, GI-3871, and AEC-1199.

Descriptors: *Cloud physics, *Urban hydrology, Pescriptors: "Cloud physics, "Urban hydrology, "Missouri, "Climatology, "Weather modification, Climatic data, Atmosphere, Clouds, Storms, Synoptic analysis, Weather data, Precipitation(Atmospheric), Humidity, Rainfall.

Identifiers: Metromex studies, "St. Louis(Missouri).

Metromex is an investigation of inadvertent weather modifications resulting from an urban environment. Findings are summarized from analyses of data collected during the first two years of the 5 year field operation, located in St. Louis. Primary focus is climatological--statistical analyses of surface studies, including studies of seasonal and storm rainfall, synoptic storm types, thunderstorms, hail, surface raincells, measure-ments of condensation nuclei and raindrop distributions, wind, temperature, humidity, and urban effects on surface and groundwater quality. Results indicate that rain, thunderstorms, and hail maximize in both intensity and duration at locations 10 to 15 miles downwind of an urban-industrial region. Limited analyses of atmospheric studies are also included. One indicated effect of heat and other emissions generated by an urban area is the presence of higher cloud bases than those found in rural regions. (Hoffman-North Carolina) W74-04509

ELECTRIC CLOUD AND WEATHER MODIFI-CATION WITH INTENSE RELATIVISTIC ELECTRON BEAMS,

Nevada Univ., Reno. Desert Research Inst. For primary bibliographic entry see Field 3B. W74-04604

DRASTIC BEACH CHANGES IN A LOW-ENER-GY ENVIRONMENT CAUSED BY HURRICANE

Florida State Univ., Tallahassee. Oceanographic Inst. For primary bibliographic entry see Field 2J.

MODELING OF TURBULENT TRANSPORT IN

THE SURFACE LAYER,
National Aeronautics and Space Administration,
Langley Station, Va. Langley Research Center.
For primary bibliographic entry see Field 2D.
W74-04795

2C. Snow, Ice, and Frost

W74-04756

R. M. Koerner.

ACCUMULATION ON THE DEVON ISLAND ICE CAP, NORTHWEST TERRITORIES, CANADA, London School of Economics and Political Available from NTIS as AD-685 348 for \$3.00 paper copy, \$1.45 microfiche. Journal of Glaciology, Vol 6, No 45, p 383-392, October 1966. 6 fig, 1 tab, 4 ref.

Descriptors: *Canada, *Glaciers, Ice, *Winds. Identifiers: *Ice caps, *Devon Island(Canada), Snow transport, Katabatic winds, Baffin Bay, Cyclonic activity, *Snow accumulation.

The pattern of accumulation on the Devon Island ice cap is described. There is an area of minimum accumulation encircling the highest part of the ice cap and 100-200 m below it. Below this zone, accumulation gradually increases to a maximum near the ice-cap edge. The overall pattern is related to snow transport by katabatic winds. There is a regional accumulation pattern of high accumulation (ca. 40.0 cm. water equivalent) in the south-east part of the ice cap and an area of low accumulation (ca. 11.0 cm. water equivalent) in the north-west. This east-south-east to west-north-west accumula-tion gradient is related to cyclonic activity to the east in Baffin Bay, and it is probably intensified by the presence of open water in the same area. (Sinha-OEIS) W74-04325

PERMAFROST: NORTH AMERICAN CONTRIBUTION TO SECOND INTERNATIONAL CONFERENCE.

Thernational Conference on Permafrost, 2nd, Yakutsk, USSR: 1973, National Academy of Sciences, Washington, D.C., 1973, 783 p.

Descriptors: *Permafrost, *North America, *Conferences, Frozen ground, Ice, Frozen soils, Engineering, Environment, Reviews, Design, Frost action, Subsidence, Freezing, Thawing, Cryology.

The scope of the second conference includes consideration of environmental, ecological, and resource development issues. Summary review apers cover the seven main conference topics. The topics are: thermal aspects; distribution; genesis, composition, and structures; physics, physical sis, composition, and structures; physics, physical chemistry, and mechanics; groundwater; survey-ing and predicting; and engineering and construc-tion. (See also W74-04347 thru W74-04423) (Knapp-USGS) W74-04346

THERMAL CONDITIONS IN PERMAFROST--A REVIEW OF NORTH AMERICAN LITERA-

National Research Council of Canada, Ottawa (Ontario).

.. W. Gold, and A. H. Lachenbruch. In: International Conference on Permafrost, 2nd, Yakutsk, USSR, 1973, p 3-25, 1973. 5 fig, 1 tab, 117 ref, append.

Descriptors: *Permafrost, *Reviews. *Temperature, *Heat flow, *Publications, Geothermal studies, Heat transfer, Heat budget, Frozen soils, Frozen ground.

Thermal conditions in permafrost are reviewed in two sections, the surface boundary condition and subsurface thermal conditions. In principle, the ground thermal regime can be determined for any time at a given location if the boundary conditions are specified. A particularly complex set of condi-tions exists at the surface where the earth is in tions exists at the same which the temperature is continually changing in order to maintain a balance between heat lost or gained by radiation, evaporation, convection, conduction, and precipitation. The most satisfactory method of establishing this upper boundary condition ap-pears to be by direct measurement of the temperature at some depth with respect to the surface perimposed on the effects of changes in surface temperature are those due to heat flow from the interior of the earth. Although this amount of heat is

small relative to the cyclical contributions at the surface, it has a significant influence on the temsurface, it has a significant influence on the temperature gradient at depths greater than that to which the annual temperature changes propagate and, therefore, on the thickness of permafrost. Temperature changes and their effects in porous ground are complicated by movement of the fluid ground are complicated by movement of the fluid and gaseous phases of water. Additional complicating effects are caused by the phase change that occurs in bulk water at 0 deg C and at lower temperatures for water under the influence of the surface of the solid. Good progress has been made in taking into account phase changes in ground temperature calculations and in understanding their effects on the ground thermal regime, but both the qualitative and quantitative understand-ing of the contribution and effects of water and vapor movement are still in a primitive state. (See also W74-04346) (Knapp-USGS) W74-04347

INFLUENCE OF CLIMATIC AND TERRAIN FACTORS ON GROUND TEMPERATURES AT THREE LOCATIONS IN THE PERMAFROST REGION OF CANADA, National Research Council of Canada, Ottawa

R. J. E. Brown.

In: International Conference on Permafrost, 2nd, Yakutsk, USSR, 1973, p 27-34, 1973. 10 fig, 1 tab, 5 ref.

Descriptors: *Permafrost, *Temperature, *Terrain, Frozen ground, Frozen soils, Freezing, Thawing, *Canada, Arctic, Data collections, Heat flow. Geothermal studies.

Regular periodic measurements (at least monthly) of ground temperatures are being taken at three locations in northern Canada to assess the influence of climatic and terrain factors on permafrost. These are Thompson, Manitoba, situated in the southern part of the discontinuous permafrost zone, Yellowknife, Northwest Territories, in the northern part of the discontinuous permafrost zone, and Deuro Lebed located in the Condition zone, and Devon Island, located in the Canadian Arctic Archipelago (Queen Elizabeth Islands) in the northern part of the continuous zone. Ground temperature measurements with thermocouple cables down to the 15-m depth in various types of terrain are being taken at these locations and terrain are being taken at these locations and analyzed to determine the range of mean annual ground temperatures that may exist at any one site in the permafrost region. Mean annual ground tem-peratures at depths down to 15 m may differ over a 2 deg C range among various types of terrain at any one location in the permafrost region. These variations are reflected in different depths of ac-tive layer that may range from less than 0.5 m to hours than 2 m even in the northern never of the more than 2 m, even in the northern part of the continuous zone. Variations greater than 1 deg C may occur even between sites only a few tens of meters apart. These local differences can reflect significant differences in the extent and thickness of permafrost and the susceptibility to thawing. (See also W74-04346) (Knapp-USGS)

DEEP TEMPERATURE OBSERVATIONS IN THE CANADIAN NORTH,

Department of Energy, Mines and Resources, Ot-tawa (Ontario). Earth Physics Branch.

In: International Conference on Permafrost, 2nd, Yakutsk, USSR, 1973, p 35-40, 1973. 3 fig, 22 ref.

*Permafrost. *Temperature, Descriptors: *Geothermal studies, *Canada, Arctic, Data col-lections, Wells, *Boreholes, Heat flow, Heat budget.

Boreholes of depths of 300 m or more are used for temperature observations at 22 locations in Canada within permafrost. In addition, multisen-sor cables were installed in 17 boreholes, varying in depth from 20 to 60 m. The thickest permafrost

measured in Canada is 530 m at Winter Harbour on Melville Island, in a well only 1,000 m from the present shoreline. Thicknesses of 1,000 m should exist on the basis of known rock types, surface temperature distribution, and a postulated regional heat flow distribution based on values measured in southern Canada. Very thick permafrost is to be southern Canada. Very thick permatrost is to be expected if low surface temperatures occur in the areas of exposed shield rocks, or of shield rocks beneath present icecaps, and in areas where the Arctic Platform is overlain by dolostones and quartz sandstones. Measured thicknesses in the arctic islands range from 275 to 530 m. A thickness of over 400 m was projected in northern Quebec based on temperatures to depths of 260 m and a thickness of 360 m measured on Richards Island in the Mackenzie Delta. Permafrost thicker than 300 m probably occurs extensively through the shield of northern Keewatin District, since surface temperatures are -10 deg C or lower. Some permafrost occurrences have been reported to the south of the present 0 deg C surface temperature isotherm. (See also W74-04346) (Knapp-USGS) W74_04349

A GENERAL SOLUTION FOR THE TWO-DIMENSIONAL, TRANSIENT HEAT CONDUC-TION PROBLEM IN PERMAFROST, USING IM-PLICIT, FINITE DIFFERENCE METHODS. Brown and Root, Inc., Houston, Tex.

R. M. Kliewer.
In: International Conference on Permafrost, 2nd, Yakutsk, USSR, 1973, p 41-51, 1973. 7 fig, 1 tab, 2

Descriptors: *Permafrost, *Heat flow, *Computer programs, Thawing, Freezing, Finite element analysis, Consolidation, Frost heaving, Subsidence, *Conduction, *Heat transfer.

A computer programming technique is presented for mathematically modeling a large class of problems involving the thermal response of a permafrost medium. Allowance was made for seasonal temperature variation at the surface and also for the addition of extraneous thermal disturbances. This permits prediction of the effect of thermal disturbances on the natural variation of temperature in the permafrost. There is a provision for handling a stratified permafrost medium having layers possessing different thermal properties. Consideration was also given to changes of thermal properties with freezing and thawing, and the latent heat of fusion was taken into account. (See also W74-04346) (Knapp-USGS)

THERMAL DISTURBANCE DUE TO CHANNEL SHIFTING, MACKENZIE DELTA, N.W.T., CANADA, Carleton Univ., Ottawa (Ontario).

M. W. Smith, and C. T. Hwang. In: International Conference on Permafrost, 2nd, Yakutsk, USSR, 1973, p 51-60, 1973. 6 fig, 2 tab,

16 ref.

Descriptors: *Permafrost, *Alluvial channels, *Thawing, *Freezing, *Heat flow, Mathematical models, *Canada, Finite element analysis.

The geomorphological pattern of permafrost dis-tribution was studied under a shifting river channel and the process was analyzed quantitatively in the framework of heat conduction theory. At present, the Mackenzie river is cutting into a spruce-covered surface in excess of 300 years old (as indicated by tree cores) on the outside bends of meanders, with consequent degradation of permafrost. The talik, which exists beneath the river, follows the river migration. Also as the cut bank recedes, new deposits are formed on the slipoff slope, and, under the influence of low-mean annual surface temperatures, permafrost will form. The process of geomorphic change is accompanied by a vegetation succession that produces a complex interaction between topography, vegetation, microclimate, and ground temperatures. The calculated variations in permafrost distribution com-pare well with field measurements and, in a qualitative sense, with those reported in the litera-ture. The finite element formulation of the heat conduction equation provides good temperature predictions and demonstrates the consistency of predictions and demonstrates the consistency of the ground temperature field in the framework of heat conduction theory. The use of a temperature wave to simulate the river migration yields satisfactory results. (See also W74-04346) (Knapp-USGS) W74-04351

ECOLOGICAL EFFECTS OF RIVER FLOOD-ING AND FOREST FIRES ON PERMAFROST IN THE TAIGA OF ALASKA,
Forest Service (USDA), College, Alaska. Inst. of

ern Forestry.

L. A. Viereck. In: International Conference on Permafrost, 2nd, Yakutsk, USSR, 1973, p 60-67, 1973. 7 fig, 1 tab, 26 ref.

Descriptors: *Permafrost, *Freezing, *Thawing, Floods, Forest fires, Ice, Frozen ground, Vegetation effects, Silting, Ecology, *Alaska. Identifiers: *Taiga(Alaska).

In the taiga of Alaska, permafrost and vegetation are closely related. In areas underlain by permafrost, the nature of the vegetation is important in determining the thickness of the active layer. In a black spruce stand, the active layer is normally a black spruce stand, the active layer is normally 30-60 cm thick. Flooding has several effects on the vegetation-permafrost relationship on floodplain forest stand. Flooding and water table rise by warm water can quickly thaw existing permafrost or cause higher soil temperatures over at least the upper 150 cm of the substrate. Siltation during flooding results in the compaction and death of the moss layers, thus reducing their insulating value in summer which results in higher soil temperatures and an increase in thickness of the active layer. The results of thawing of frozen layers heavily laden with ice can be surface subsidence, tipping of trees, and eventually the formation of thaw ponds. In some cases, flooding over permafrost could be a conserved to the control of the country of the countr results in a separation of the organic layer at the permafrost boundary and a compression and rolling of the organic layer into peat mounds. Fire in forest types underlain by permafrost results in a temporary thickening of the active layer. For the first 15 years after fire, thaw is more than 1 m; return to preburn thaw levels takes about 50 years. (See also W74-04346) (Knapp-USGS) W74-04352

DISTRIBUTION OF PERMAFROST IN NORTH AMERICA AND ITS RELATIONSHIP TO THE ENVIRONMENT: A REVIEW, 1963-1973, National Research Council of Canada, Ottawa

R. J. E. Brown, and T. L. Pewe. In: International Conference on Permafrost, 2nd, Yakutsk, USSR, 1973, p 71-100, 1973. 8 fig, 1 tab,

Descriptors: *Permafrost, *North America, *Reviews, *Bibliographies, Frozen soils, Frozen ground, Ice, Distribution patterns, Canada, United States, Alaska, Cryology, Publications.

This review summarizes progress since 1963 in knowledge of the distribution of permafrost and the relation of environmental factors in North America. The extent of the discontinuous and continuous permafrost zones in Canada has been generally determined during the past 10 years, although detailed local information is still sparse in all but a few areas. The general distribution of pe mafrost in Alaska was known prior to 1963, while investigations in Greenland were initiated at about that time. The relationship of permafrost distribu-tion and occurrence to climatic and terrain factors has received much attention in the past decade,

Group 2C-Snow, Ice, and Frost

resulting in steady improvement in the ability to resulting in seady improvement in the above vo-predict permafrost conditions in areas not previ-ously investigated. The general correlations are now known, but much refining remains to be done. Four significant features of the investigations in North America during the past 10 years, relating to distribution of permafrost and its relationship to the environment, are the awareness of submarine permafrost extending under the seas in northern coastal areas; the origin, distribution, and amount of ground ice, especially massive ice; the increasing interest in features denoting the distribution of permafrost in past geological periods; and the dis-tribution of permafrost at high elevations in the mountainous areas of western Canada and the United States. (See also W74-04346) (Knapp-W74-04353

A GEOECOLOGICAL TERRAIN ANALYSIS OF DISCONTINUOUSLY FROZEN GROUND IN THE UPPER MACKENZIE RIVER VALLEY, CANADA,

Department of the Environment, Edmonton (Alberta).

C. B. Crampton, and N. W. Rutter.

In: International Conference on Permafrost, 2nd, Yakutsk, USSR, 1973, p 101-105, 1973. 8 fig, 2 ref.

Descriptors: *Permafrost, *Surveys, *Aerial photography, *Terrain analysis, Geomorphology, Frozen ground, Ice, Frozen soils, Engineering, Arctic, *Canada.

Aerial photographs may be used for rapid identification of terrain types in terms of surficial geology, microrelief, and vegetation, which is significant regarding permafrost conditions. High forest is indicative of freely drained sites, such as alluvial terraces, fans, and glaciofluvial deposits, and sand dunes, which offer the best construction sites. Relatively featureless flats on aerial photographs. though often with local reticulate bogs, are indicative of seasonally waterlogged lands on lacustrine or till deposits that present the engineer with problems typical of permafrost-free areas. However, where the terrazoid pattern can be seen on aerial photographs, raised peat with near-surface permafrost and ground ice is intricately associated with pools, often without permafrost. These pat-terns are characteristic of lacustrine and till deposits that contain ground ice. On uplands, with deposits that contain ground ice. On appairs, while characteristic till morphology, a deranged drainage pattern on flats, especially a subparallel drainage pattern on slopes delineated by lichen on raised parts and Sphagnum in drainage runnels, in indica-tive of a shallow permafrost table and ground ice. These areas are best avoided for most construction purposes. (See also W74-04346) (Knapp-USGS) W74-04354

A SPATIAL CORRELATION BETWEEN PLANT DISTRIBUTION AND UNFROZEN GROUND WITHIN A REGION OF DISCONTINUOUS PER-MAFROST.

Alberta Univ., Edmonton.

D. Gill.

In: International Conference on Permafrost, 2nd, Yakutsk, USSR, 1973, p 105-113, 1973. 9 fig, 8 ref.

Descriptors: *Permafrost, *Canada, *Vegetation effects, Frozen ground, Freezing, Thawing, Alluvial channels, Erosion, Thawing, Geomorphology.

Some locations in the Mackenzie Delta are underlain by taliks, and hypotheses are given for their existence. There is a close areal relationship between the distribution of these taliks and the distribution of one discrete plant association. Taliks under youthful slipoff slopes in the Mackenzie Delta undergo spatial variations over time. The freezing isotherm should be prograding into the taliks from the adjacent large cells of permafrost such as that situated below the Salix-Alnus and

Picea associations. The process of frost accretion rices associations. The process or lags behind the progradation of slipoff slopes, depending on the rate at which individual channel segments shift. Since permafrost is currently degrading along cut banks opposite such locations, it is clear that the formation and decay of perennially frozen ground in the Mackenzie Delta is a dynamic process that sees major areal displacements of permafrost bodies through time. (See also W74-04346) (Knapp-USGS) W74-04355

INDIRECT MAPPING OF THE SNOWCOVER FOR PERMAFROST PREDICTION AT SCHEF-

FERVILLE, QUEBEC, McGill Univ., Schefferville (Quebec). McGill Sub-

H. B. Granberg.
In: International Conference on Permafrost, 2nd, Yakutsk, USSR, 1973, p 113-120, 1973. 8 fig, 18

*Permafrost, *Snow cover, ning, *Canada, *Aerial photog-Descriptors: *Pern *Mapping, Mining, cover. raphy, Surveys.

Two different techniques of indirect mapping of the snowcover are useful in delineating permafrost in the Schefferville area of Quebec. A method based on sequence melt photographs is suitable for permafrost prediction on a regional scale, where only the surficial extent of permafrost is considered. Three to four flights, evenly spaced through the first 150 cm of snow depth decrease, are sufficient to obtain good information about the spatial variations in snow accumulation for the particular year. When there are appreciable re-gional differences in melt rates within the area photographed, additional snow measurements are required for calibration of the class limits. A computerized model was developed for more detailed work where the actual geometry of permafrost is important. A particular advantage of this model is its suitability for further modeling of the thermal effects of the snowcover and other topographically related factors. Empirical equations were determined for the influence of the seasonal snowcover on ground temperatures. (See also W74-04346) (Knapp-USGS)

PERMAFROST AND ITS RELATIONSHIP TO OTHER ENVIRONMENTAL PARAMETERS IN A MIDLATITUDE, HIGH-ALTITUDE SETTING, FRONT RANGE, COLORADO ROCKY MOUN-TAINS, Colorado Univ., Boulder.

J. D. Ives.

In: International Conference on Permafrost, 2nd, Yakutsk, USSR, 1973, p 121-125, 1973. 4 fig, 1 tab,

Descriptors: *Permafrost, *Colorado, *Alpine, Frozen ground, Frozen soils, Heat budget, *Rocky Mountain Region, Climatology.

Permafrost occurs throughout the Colorado Rocky Mountains. One of the most important environ-mental parameters in this high-altitude and rela-tively low-latitude region is incoming shortwave radiation and hence slope angle and aspect; another is the interrelationships of wind, snow distribution, and topography. At elevations of 3,500 m and above, immediately above treeline, patches of permafrost should be expected under wet sites that are largely blown free of snow during winter. Thickness of the active layer may be less than 2 m and freezeback to the permafrost table may not be complete until mid-February or early March. There will be no permafrost under dry sites, southfacing slopes, and snow-accumulation sites. The highest summits of the Front Range (4,000-4,400 m), with an extrapolated mean annual air temperature of about -9 deg C for 4,400 m, should be extensively underlain by permafrost of considerable thickness. The predominantly dry conditions and extensive areas of bedrock outcrop severely limit the accumulation of significant amounts of ground ice. Nevertheless, the possible presence of per-mafrost is sufficient to indicate that any mountain development should take it carefully into account. (See also W74-04346) (Knapp-USGS)

POSTGLACIAL PERMAFROST FEATURES IN EASTERN CANADA,

Laval Univ., Quebec.

D. Lagarec. In: International Conference on Permafrost, 2nd, Yakutsk, USSR, 1973, p 126-131, 1973. 7 fig, 12

Descriptors: *Permafrost, *Paleoclimatology, *Canada, Geomorphology, Terrain analysis, *Aerial photography, Frozen ground, Frost action. Identifiers: Quebec.

Circular mounds and flat-bottomed depressions Observed in aerial photographs of northern Quebec were formed by postglacial permafrost. Other features include polygonal cracking of uniform surface in blocks 10-20 m long, formation of flat-topped and steep-sided mounds by erosion along the cracks, and smoothing of mound slopes by sliding of side material. These observations in northern Quebec appear to corroborate those made in the Soviet Union and lead to the conclusion that in southern Quebec similar features were formed under similar conditions, namely discon-tinuous permafrost and cold humid climate with a mean annual air temperature of -2 to -4 deg C, meaning 5-7 deg C cooler than the present tem-perature. (See also W74-04346) (Knapp-USGS) perature. (S W74-04358

THE OCCURRENCE AND CHARACTERISTICS OF NEARSHORE PERMAFROST, NORTHERN

ALASKA, R. I. Lewellen.

In: International Conference on Permafrost, 2nd, Yakutsk, USSR, 1973, p 131-136, 1973. 3 fig. 2 tab,

Descriptors: *Permafrost, *Beaches, *Alaska, *Beach erosion, Water temperature, Frozen ground, Barrier islands, Sedimentation. Identifiers: Undersea permafrost.

Permafrost is known to occur under the coastal waters of the Chukchi and Beaufort seas north of Alaska. Sea level, at or near the present level for the past years, can simulate eustatic change by the thermal erosion of the coastline. Rates of erosion ranging from 10 to 30 m per year, although opera-tional only for the brief open-water period, can ac-count for shoreline changes of 5-15 km in just 500 years in the Beaufort Sea region. With mean an-nual bottom water temperatures below 1.0 deg C, there are expected to be considerable expanses of offshore permafrost. As the seawaters transgress the coast, the bottom elevations move farther below sea level with distance away from the shoreline. This is transgression by thermal erosion or truncation without a tectonic or eustatic change. The change in bottom elevation is due, in part, to thaw subsidence and consolidation. On parts of these thermally truncated or thermal planation benches, storm waves and weak currents and tides winnow and scour fine material. As the sea thermally truncates the land, modifications to the ex-isting permafrost, at or below the level of truncaisting permatrost, at or below the level of trunca-tion, are in the form of mean annual surface tem-perature change and the possible circulation of seawater in the new seasonal thaw layer. In general, a warmer but still negative mean annual temperature prevails after the shoreline passes. If the sea level has been oscillating only 1-3 m around the present level for the past 3,000 or 4,000 years, and if allowances are made for changes in coastal erosion rates, extensive areas of truncated per-mafrost must still exist under the Beaufort Sea floor. (See also W74-04346) (Knapp-USGS) W74-04359

FROZEN AND UNFROZEN GROUND, AN-TARCTICA, IDENTIFICATION

Northern Illinois Univ., De Kalb L. D. McGinnis, K. Nakao, and C. C. Clark. In: International Conference on Permafrost, 2nd, Yakutsk, USSR, 1973, p 136-146, 1973. 9 fig, 3 tab,

Descriptors: *Permafrost, *Antarctic, *Geophysics, *Resistivity, *Seismic studies, Electrical studies, Frozen ground, Salinity.

Geophysical measurements in the dry valleys of Antarctica reveal abnormally thin permafrost with respect to the present climate. Presuming a normal respect to the present cumate. Fresuming a normal continental geothermal gradient of about 18 deg C/km, permafrost thicknesses should be on the order of 1 km. From laboratory studies, field observations, and theoretical analyses, it is inferred that the lack of development of thick confining permafrost is due to the presence of solar-heated permafrost is due to the presence of solar-heated lakes, which were much more extensive in the recent past, and to high water and soil salinities. Even where permafrost soil temperatures are present, the high soil salinities depress the freezing present, the high soil salinities depress the freezing point to such a degree that the permafrost remains unfrozen in some locations and permits the movement of pore fluids. Beginning with Taylor Glacier in western Taylor Valley and extending eastward to the coast, all geophysical studies conducted indicate a layer of thin permafrost overlying unforzen sediment. Along the tongue of Taylor Glacier, confining permafrost extends to depths greater than the maximum depth of exploration (150 m). East of Lake Bonney, confining permafrost is 20-30 m thick but is underlain by saturated, unfrozen sediment. In Wright Valley, thin rated, unfrozen sediment. In Wright Valley, thin permafrost or a lack of permafrost altogether, may extend from Don Juan and Don Quixote ponds in the west to eastern Lake Vanda. Thick permafrost is associated with thin sediment cover east of the lake; however, electrical measurements indicate that thin permafrost again prevails in the vicinity of Bull Pass. Victoria Valley and Lake Vida are underlain by thick and extensive permafrost. A thin layer of entrapped brine or low resistivity soil may rest on the bottom of Lake Vida as suggested by a long Schlumberger resistivity station. (See also W74-04346) (Knapp-USGS) W74-04360

PERMAFROST CONSIDERATIONS IN LAND USE PLANNING MANAGEMENT, Bureau of Land Management, Anchorage, Alaska.

C. V. McVee.

In: International Conference on Permafrost 2 nd, Yukutsk, USSR, 1973. p 146-151, 1973. 5 fig, 6 ref.

Descriptors: *Land use, *Permafrost, *Land management, Subsidence, Erosion, Conservation,

Permafrost is a dominant factor that must be considered by the land manager in the Arctic. Conventional resource utilization and extraction techniques must be modified to compensate for this physical phenomenon. Prior to implementing resource utilization and extraction activities, the resource utilization and extraction activities, unland manager must be aware of the eventual implications of any proposed decision and its impact on future productivity and use of each finite commodity. Even a minor surface disturbance may alter the thermal balance sufficiently to induce permafrost thawing, which may result in sub-sidence or soil erosion or both, and affect such features as surface relief, access, siltation, and wildlife habitat. Changes in surface relief, such as depressions from subsidence or gullies from erosion by waters of melting soil ice interfere with subsequent construction or land travel. Eroding soil solids become deposited at some lower points in the watershed or drainageway, which further limit utilization of the land. Also, siltation may adversely affect water quality and the aquatic biota. (See also W74-04346) (Knapp-USGS) W74-04361

PERMAFROST AND SNOWCOVER RELA-TIONSHIPS NEAR SCHEFFERVILLE, McGill Univ., Schefferville (Quebec). McGill Sub-Arctic Research Lab. F. H. Nicholson, and H. B. Granberg.

In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973. p 151-158, 1973. 7 fig, 3 tab,

Descriptors: *Permafrost, *Snow cover, Frozen ground, Ice, Snow, *Canada, Temperature, Regression analysis, Groundwater, Snowpacks, Aerial photography, Mapping.

Snow is the most important factor controlling permafrost distribution in the Schefferville area of Quebec, and there is a linear relationship between ground temperatures and snow depth. Groundwater is an important subsidiary factor. The temperature at any depth correlates best with a snow area that has a radius two times that denth. A regression equation was calculated for combine tions of temperature depth and snow radius that gave the highest correlation coefficients. This equation accurately predicts presence or absence of permafrost for 82% of a sample of 123 points, and the explanation is increased to 94% if points known to be affected by groundwater are removed. The depth of snow corresponding to a ground temperature of 0 deg C was 75 cm. (See also W74-04346) (Knapp-USGS) W74-04362

STUDIES AT THE TIMMINS 4 PERMAFROST

EXPERIMENTAL SITE,
McGill Univ., Schefferville (Quebec). McGill SubArtic Research Lab.
F. H. Nicholson, and B. G. Thom.
In: International Conference on Permafrost 2nd.

Yakutsk, USSR, 1973. p 159-166, 1973. 5 fig, 1 tab,

Descriptors: *Permafrost, *Snow cover, *Frozen ground, Ice, Snow, *Canada, Temperature, Regression analysis, Groundwater, Snowpacks, Mapping, Geophysics, Borehole geophysics, Re-Identifiers: Schefferville(Ouebec).

Snow is the most important factor controlling the distribution of the permafrost in the Schefferville area of Quebec. The active layer is normally 3-4 m thick. Several examples of active layers up to 10 m deep are found, and this greater depth of thaw is due to shallow groundwater movement. The ther-mal diffusivity of the ground is often very high, as evidenced by the penetration of annual temperature waves as deep as 25-30 m. Moisture contents of the frozen ground range between 3 and 40% by volume and are commonly on the order of 15%. Sharp change in physical properties of the rocks, due to the change from frozen to unfrozen state, occurs at 0 deg C. The three-dimensional pattern of the mean isotherms and the relationships between snow and ground temperatures demonstrate that lateral heat flow is particularly important. It is postulated that the present permafrost distribution in upland sites is in equilibrium with contemporary environmental conditions and that relict permafrost is not extensive. (See also W74-04346) (Knapp-USGS) W74-04363

GEOCHEMISTRY OF PERMAFROST AND QUATERNARY STRATIGRAPHY,

Arizona State Univ., Tempe. T. L. Pewe, and P. V. Sellmann. In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973. p 166-170, 1973. 2 fig, 1 tab, Descriptors: *Permafrost, *Geochemistry, *Stratigraphy, Glacial drift, Quaternary epoch, Soils, Frozen soils, Frozen ground, Resistivity, Salinity, *Alaska. Identifiers: *Fairbanks(Alas).

A new approach to the study of permafrost is the chemical investigation of its ice and sediments. The existing ionic concentration gradients and their lateral dimensions can be indicative of cold regions environments and provide a measure of conditions prior to the formation of the perennially frozen ground. The distribution of soluble and exchangeable ions in soils, perennially frozen ground, and sediments underlying water bodies is influenced by both the materials and the present and past depositional and leaching environments. and past depositional and reaching environments. For the same material and environments, low con-centrations indicate considerable leaching or freshening and high concentrations indicate lack of these active processes or enrichment by ground or surface waters. Silts and clays retain more solu-ble and exchangeable ions than do sand and gravels. Ionic concentration generally increases with depth, particularly in uplifted marine sediments. In the Fairbanks area, an abrupt change in chemical concentrations of extractable cations in permafrost shows a stratigraphic unconformity in retransported sediments of Wisconsinan age. Preliminary interpretations suggest thawing and refreezing above the unconformity. (See also W74-04346) (Knapp-USGS) W74-04364

STRATIGRAPHY AND DIAGENESIS OF PERENNIALLY FROZEN SEDIMENTS IN THE BARROW, ALASKA, REGION,

Cold Regions Research and Engineering Lab., Hanover, N.H.

P. V. Sellmann, and J. Brown. In: International Conference on Permafrost 2nd, Yukutsk, USSR, 1973. p 171-181, 1973. 5 fig. 5 tab,

Descriptors: *Stratigraphy, *Permafrost, *Alaska, Soil formation, Diagenesis, Sedimentation, Sedimentology, Intertidal areas. Identifiers: *Barrow(Alaska).

The late Quaternary history of the northern Alaskan Arctic Coastal Plain is discussed. The last major marine transgression deposited the Barrow in mid-Wisconsinan time. Recession, uplift, and formation of near-surface permafrost fol-lowed. The last 10,000 years is characterized by a gradual warming, active thaw-lake formation and degradation, and burial of surface peats through cryopedologic processes. (See also W74-04346) (Knapp-USGS) W74-04365

ORIGIN, COMPOSITION, AND STRUCTURE OF PERENNIALLY FROZEN GROUND AND GROUND ICE: A REVIEW, Pritish Columbia Univ., Vancouver. J. R. Mackay, and R. F. Black.

In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973. p 185-192, 1973. 82 ref.

Descriptors: *Permafrost, *Frozen ground, *Reviews, Ice, Frozen soils, Arctic, Quaternary period, Freezing, Thawing, Glaciation, Paleocli-

The origin of perennially frozen ground (permafrost) and ground ice on land in North America and beneath the sea floor of the Arctic Ocean reflects the geomorphic processes and the thermal variations of the late Quaternary period. thermal variations of the late Quaternary period. Many review papers and books have been published on perennially frozen ground and ground ice since the First International Conference on Permafrost in 1963. This review emphasizes massive ground ice in a brief summary of the state of knowledge of the origin, composition, and structure of permafrost. Deficiencies of

Group 2C-Snow, Ice, and Frost

knowledge are pointed out, and some recommendations for future study are made. (See also W74-04346) (knapp-USGS) W74-04369.

GROWTH OF PATTERNED GROUND IN VIC-TORIA LAND. ANTARCTICA.

Connecticut Univ., Storrs.

R F Black

In: International Conference on Permafrost 2nd. Yakutsk, USSR, 1973. p 193-203, 1973. 1 fig, 16 tab. 9 ref.

Descriptors: *Antarctic. *Permafrost. "Geomorphology, Ice, Frozen ground, Freezing, Thawing. dentifiers: "Patterned ground, "Ice wedges, "Antarctica(Victoria Land).

Growth of patterned ground at 14 sites in Victoria Land, Antarctica was measured over an interval of 6-8 years from 1961 to 1969. In Victoria Land, patterned ground consists of sand-wedge polygons in the inland areas and of ice-wedge polygons along the more humid coasts. These represent the end members of a continuum in which the ice content of the wedges ranges almost from 0% to 100%. Composite wedges, representing mixtures of ice, sand, and rubble, are most abundant and widespread. Surface patterns reflect growth stages from narrow sharp cracks corresponding to the initial wedges through shallow rounded depressions over each wedge to wider and deeper depressions with raised rims on each side and, finally, in some places only to an irregularly mounded or pimpled surface where the mounds represent the centers of former polygons. Polygons commonly vary from 5 to 40 m in diameter. Most of the patterned ground in Victoria Land is young, dating within the last 5,000 years (even with thermal corrections to be applied). Multicyclic wedges are recognized by the wedge-in-wedge structure, and ancient patterned ground is being exhumed today to start growing again. (See also W74-04346) (Knapp-USGS) W74-0436)

THERMOKARST DEVELOPMENT, BANKS ISLAND, WESTERN CANADIAN ARCTIC, Ottawa Univ. (Ontario).

H. M. French, and P. Egginton.

In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973. p 203-212, 1973. 9 fig, 4 tab, 41 ref

Descriptors: *Permafrost, *Melting, *Frozen ground, *Ice, *Erosion, *Canada, Soils, Frozen soils, Land subsidence, Subsidence, Soil erosion,

Identifiers: *Thermokarst

Some thermokarst landforms and processes are to be found on Banks Island, in the western Canadian Arctic. This island, the fourth largest in the Canadian Arctic Archipelago, lies between 71 and 75 deg N and is totally within the zone of continuous permafrost. The importance of naturally occurring thermokarst is restricted to those areas where lithological and/or soil conditions favor a high ice content, or where massive ground ice is present. The close connection that exists between thermal erosion and thermal melting is most dramatically illustrated in localized areas of badland topography that exist in close juxtaposition to well developed polygon terrain and ice-wedge junction ponds. Certain types of thermokarst such as ground ice slumping, are some of the most rapid erosional processes operating in the high Arctic at present. (See also W74-04346) (Knapp-USGS) W74-04368

PROBLEMS IN THE ORIGIN OF MASSIVE ICY BEDS, WESTERN ARCTIC, CANADA, British Columbia Univ., Vancouver. J. R. Mackay.

In: International Conference on Permafrost 2nd. Yakutsk, USSR, 1973. p 223-228, 1973. 6 fig, 16

Descriptors: Descriptors: *Ice, *Per Groundwater, *Canada, *Permafrost, *Arctic Frozen ground. Aquifers, Freezing.

Massive icy beds are of widespread occurrence in the western Canadian Arctic, Natural exposures may be seen along steep coastal bluffs, river banks, lake shores, and on hill tops where banks, lake shores, and on hill tops where disturbances have induced thawing. The prior ex-istance of massive icy beds can also be inferred in old slump scars. The massive icy beds show every conceivable gradation from icy muds to pure ice. Most of the icy beds have grown in situ, even though some buried glacier ice may be present. The widespread occurrence of massive icy beds above, or in close association with, sands and gravels suggest that these sediments served two purposes: a water source from water expulsion resulting from freezing of adjacent coarse-grained sediments and an aquifer. Massive bodies of segregated ice grow at depth in the same manner as that of segregated ice in pingos. (See also W74-04346) (Knapp-USGS) W74-04369

A SIMULATION SENSITIVITY ANALYSIS OF THE NEEDLE ICE GROWTH ENVIRONMENT,

Michigan Univ., Ann Arbor. vs. i. outcalt.

ys. 1. Outcait. In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973. p 228-234, 1973. 5 fig, 3 tab,

Descriptors: *Frost, *Frost action, Simulation analysis, Alpine, Frost protection, Frost prevention, Freezing, Thawing, Mathematical models. Identifiers: *Needle ice.

Simulation of needle ice behavior provides the basic analytical framework for the simulation of the tundra active layer. Needle ice is the result of diurnal ice segregation near the soil surface. Ice segregation results from the increase in the water fraction of a soil layer produced by the upward migration of soil water to the freezing plane after nucleation occurs and the freezing place remains at a fixed level in an initially unfrozen soil. The process of needle ice erosion produces downslope soil movement in periglacial alpine terrain and is responsible for damage to plant materials when freezing causes vertical mechanical stress within the root zone. Needle ice damage may be attenuated by artificially mulching seedbeds with plastic sheeting or porous sand layers (10 mm thick) to reduce the surface wetness, artificially introducing roughness elements into the seedbeds, and avoiding extremely shadowed and wet natural sites. The strategies may be of extreme importance in repairing tundra and alpine meadow cover damage in alpine recreation areas. Deterministic models are capable of mimicking natural phenomena not specifically woven into the fabric of the model structure. As the general equilibrium temperature structure. As the general equilibrium temperature alogorithm is spatially and temporally unconstrained dimensionally, this system of equations, when modified to include specific process information, should be applicable to the entire spectrum of periglacial phenomena. (See also W74-04346) (Knapp-USGS) W74-04370

RATES OF MASS WASTING IN THE RUBY RANGE, YUKON TERRITORY, Portland State Univ., Oreg.

For primary bibliographic entry see Field 2J.

SOIL DEVELOPMENT AND PATTERNED GROUND EVOLUTION IN BEACON VALLEY ANTARCTICA, Washington Univ., Seattle.

For primary bibliographic entry see Field 2G.

W74-04372

PHYSICS, CHEMISTRY, AND MECHANICS OF FROZEN GROUND: A REVIEW, FROZEN GROUND: A REVIEW,
Cold Regions Research and Engineering Lab.,

D. M. Anderson, and N. R. Morgenstern.

In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973. p 257-288, 1973. 11 fig, 182

Descriptors: *Frozen ground, *Frost action, Freezing, "Thawing, "Permafrost, Thermodynamics, Mass wasting, Solifluction, Soil water, Soil moisture, Water chemistry, Frozen soils, Soil physics.

Phase equilibria, thermal aspects, and physicomechanical aspects of frozen ground are reviewed. Much of the subject matter pertaining to the physics and chemistry of frozen ground derives from the nature and phenomenology of the interfaces present. The interfaces are of the following types: ice-ice (grain boundary), ice-water-air, silicate-water-silicate (primarily interlamellar), and silicate-water-ice (extralamellar). This ter-minology implies that, in contrast to the ice-ice inminiology impues that, in contrast to the ice-ice in-terface, all the others possess a component with liquid-like characteristics. In general, water move-ment in frozen soil is analogous to flow in un-frozen soils, but flow is confined primarily to the unfrozen interface, and there is little or no con-tribution of vapor transport. Because ions and solutes tend to be rejected from the growing ice lattice, they are excluded to and confined to the domains of the unfrozen interfacial water. The mechanism of frost heaving has been the subject of many investigations. Briefly, as heat is ex-tracted from above and freezing is initiated, grow-ing ice crystals coalesce into planar ice lenses. The ice lenses are enlarged by the addition of water transported from the reservoirs of soil water below. Ice-lens growth occurs at locations where below. Ice-lens growth occurs at locations where the temperature is favorable and the rate of ap-pearance and dissipation of the latent heat of freezing does not exceed the flux of soil water. (See also W74-04346) (Knapp-USGS) W74-04373

THE UNFROZEN WATER AND THE AP-PARENT SPECIFIC HEAT CAPACITY OF FROZEN SOILS,

Cold Regions Research and Engineering Lab., Hanover, N.H.

D. M. Anderson, A. R. Tice, and H. L. McKim. In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973. p 289-295, 1973. 6 fig, 1 tab,

Descriptors: *Frozen soils, *Freezing, *Thawing, *Soil moisture, Equations, Soil water, Temperature, Thermal capacity, Heat flow, Aqueous solutions, Heat transfer.

When the thermal regime of permafrost is changed as a result of engineering operations, or because of a perturbation of the local environmental condi-tions, the ice-water phase composition of the frozen soils also must change. The influence of this change on the stability and function of an en-gineering installation can be considerable. A convenient equation is given for predicting the ap-parent specific heat capacity and the cumulative heat absorption versus temperature curve of heat absorption versus temperature curve of frozen soils from their water-ice phase composi-tion data. The availability of this equation facilitates the calculation of thaw and frost penetration. An equation for the apparent specific heat capacity of frozen ground incorporating the relationship expressed in the first of these is derived. Apparent specific heat capacities are cal-culated as a function of temperature for six culated as a function of temperature for six representative soils at each of three water con-tents. In addition, representative curves that de-pict the cumulative heat absorbed in bringing each pict the cumulative heat absolute in ordination from -10 deg C through the melting point were

Snow, Ice, and Frost—Group 2C

computed and are given in graphical form. (See also W74e04346) (Knapp-USGS) W74-04374

MECHANICAL PROPERTIES OF FROZEN GROUND UNDER HIGH PRESSURE.

Cold Regions Research and Engineering Lab., Hanover, N.H.

E. Chamberlain.

In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973. p 295-305, 1973. 11 fig, 2

Descriptors: *Soil mechanics, Seismic studies, *Compressibility, *Frozen soils, Frozen ground, Ice, Cryology, Craters, Rock mechanics, Soil physical properties, Soil physics, Mechanical properties.

The evaluation of crater and crater formation and seismic waves in regions of permafrost requires considerable knowledge of the high pressure behavior of frozen soil and ice. The compressibility of saturated frozen soil to 30 kbar is readily pre-dicted from knowledge of properties, such as degree of saturation with ice, porosity, and the compressibilities of ice and mineral components. The accuracy is limited at low pressures and low degrees of saturation. The behavior of the phase transformations is somewhat obscured by rate processes and the reordering and crushing of the mineral particles. Confining pressure has great influence on the shear strength of frozen soils. At a temperature of -10 deg C and a strain rate of ap-proximately 6 percent/min, three distinct stress regions are observed: a low-pressure region of constant or increasing shear stress, a mid-pressure re-gion of decreasing shear stress, and a high-pres-sure region of slightly increasing shear stress. It is suggested that four elements--interparticle friction and particle interlocking, unfrozen water content, pressure melting of ice, and the ice-water phase change-control the triaxial compression behavior of saturated frozen soils. (See also W74-04346) (Knapp-USGS) W74-04375

EFFECT OF POROSITY ON AMOUNT OF SOIL WATER TRANSFERRED IN A FREEZING SILT,

ers - The State Univ., New Brunswick, N.J. A. R. Jumikis

In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973. p 305-310, 1973. 4 fig, 2 tab, 6 ref.

Descriptors: *Frozen ground, *Groundwater movement, *Porosity, *Freezing, *Thawing, Mass transfer, Pores, Water vapor, Thermodynamics, Soil moisture, Water chemistry, Pore water, Ice, *Soil water. Soil water.

The effects of porosity of a silty glacial outwash frost-prone soil on the amount of soil moisture transferred from groundwater to the cold front (0 deg C isotherm) upon freezing were studied. The porosity is the primary factor controlling the amounts of heat flow, moisture transfer, and all the related phenomena, as clearly demonstrated by the similar trends of all the related factors plotted together as a function of porosity. Depend ing on the magnitude of the porosity of the soil, moisture may be transferred upward from ground-water to the cold front by way of various moisture transfer mechanisms. The effective soil moisture transfer mechanism is by way of the water-film flow (unsaturated flow) within the porosity range between 27.8% and 47.8%. The moisture transfer by the film-flow mechanism is virtually unaccompanied by vapor diffusion. Between porosities of 60% and 100%, the effective soil moisture transfer mechanism is vapor diffusion. The vapor transport mechanism, however, is an ineffective one. (See also W74-04346) (Knapp-USGS) W74-04376

EVALUATION OF IN SITU CREEP PROPERTIES OF FROZEN SOILS WITH THE PRESSUREMETER, Ecole Polytechnique, Montreal (Quebec).

B. Landanyi, and G. H. Johnston.

In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973. p 310-318, 1973. 6 fig. 9 ref.

Descriptors: *Permafrost, *Creep. *Rheology, *Instrumentation, *Borehole geophysics, Stress, Strain, Frozen soils, Soil strength, Soil mechanics, Soil physical properties, Ice.

The Menard pressuremeter is a borehole dilatometer for in situ measurement of stress-strain and strength properties of soils and rocks. It consists of an inflatable probe, composed of two coaxial cells, and a pressure-volume control device that allows a given pressure to be applied to the wall of the borehole and the resulting volume increase of the hole to be observed. After some minor modifications, the standard pressuremeter equipment proved to be suitable for performing creep tests in permafrost. The method proved feasible for the determination of creep parameters of frozen soils in situ and the prediction of long-term strength. To obtain sufficient creep information for the proposed method to be applicable, however, it is recommended that, in addition to conventional short-term pressuremeter tests, the following two types of creep tests be performed: multistage creep tests with about 15 min per stage, and onestage creep tests conducted at different pressure levels to check the linearity of creep lines for long-time intervals. (See also W74-04346) (Knapp-W74-04377

SHOCK-WAVE STUDIES OF ICE AND TWO

FROZEN SOILS, California Univ., Livermore. D. B. Larson, G. D. Bearson, and J. R. Taylor. In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973. p 318-325, 1973. 15 fig, 1 tab, 8 ref.

Descriptors: *Frozen soils. *Soil physical properties, *Cryology, Thermodynamics, Soil physics, Strength of materials, Compressibility. Identifiers: *Shock waves.

Shock-wave experimental techniques used in conjunction with one-dimensional numerical simula-tion models represent a useful technique for determining high-strain-rate equations of state in studying frozen materials and provide a unique examination of the compressibilities of this important group of materials. The Ice I-water phase transformation occurs during shock-wave loading both in pure ice and in the interstitial ice in saturated frozen soils. However, the observed final loading states are all in the mixed-phase region, and unloading data imply a continuation of the transformation during the initial part of this unloading. This unloading behavior creates a large energy sink whenever decaying shock waves propagate at stress levels above 2 kbar and to at least 15 kbar and also may occur at stress levels above this range. The relatively rapid attenuation of the shock wave in frozen materials is directly related to this loss of energy. Numerical simula-tion models that duplicate this rate of attenuation are also consistent with the loading and unloading observed in the uniaxial compression experiments. The differences between ice and frozen soil are a direct result of a larger area between the loading and unloading paths in the soils. Reasons for this difference are a slower transformation rate upon loading, followed by relatively rapid transforma-tion in the initial unloading or limited transformation back to Ice I after the material unloads. Temperatures behind the shock and rarefaction waves could play an important part in the reverse trans-formations by stabilizing part or all of the water phase. (See also W74-04346) (Knapp-USGS) W74-04378

THAW CONSOLIDATION OF ALASKAN SILTS AND GRANULAR SOILS, Woodward-Lundgren and Associates, Oakland,

U. Luscher, and S. S. Afifi.

In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973. p 325-334, 1973. 8 fig, 11

Descriptors: *Thawing, *Consolidation, *Subsidence, *Frozen soils, *Permafrost, Soil Descriptors: tests, Ice, Soil mechanics, Soil physical proper-ties. *Silts.

An extensive investigation was made of thaw consolidation behavior of undisturbed frozen silts and granular soils from Alaska. Frozen silt samples were thawed and consolidated one-dimensionally with a range of vertical pressure from 12 to 384 kN/sq m using standard consolidation test equip-ment; these tests involved thawing with different pressures, as well as thawing with a single pressure and consolidating further with additional pressures. Frozen silt-sand samples were thawed pressures. Frozen silf-sand samples were thawed and consolidated by two methods-one-dimen-sionally in the standard odometer test and anisotropically in the standard triaxial test with vertical-to-horizontal pressure ratios of 2 and 3, thus minimizing the changes in sample cross section during thawing and consolidation. Anisotropic thaw consolidation tests were made on dirty gravels and on clean sands and gravels. Uniaxial (one-dimensional) thaw strains can be estimated from triaxial thaw consolidation, which is the usual initial step in a consolidated, undrained strength test. The same result is true for silt-sands. (See also W74-04346) (Knapp-USGS) W74-04379

MECHANICAL PROPERTIES OF ROCKS AT

MECHANICAL PROPERTIES OF ROCKS AT LOW TEMPERATURES, Cold Regions Research and Engineering Lab., Hanover, N.H. M. Mellor.

In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973. p 334-344, 1973. 7 fig, 3 tab,

Descriptors: Permafrost, *Frozen ground, *Rock mechanics, *Strength of materials, Mechanical properties, Freezing, Moisture content, Rock properties, Strength.

Rock becomes significantly stronger when it freezes. Pore water in typical rock freezes progressively, and for each rock type there is a characteristic relation between unfrozen water content and temperature which depends to a large degree on surface area. Some water, correspond-ing closely to the maximum adsorbed water content, remains unfrozen at temperatures of -10 deg C and lower. Thickness, continuity and mobility of interfacial water decrease with decreasing tem-perature down to approximately -125 deg C. Rapid initial freezing of pore water in saturated rock can cause abrupt volumetric expansion of the rock, with strains that approach the tensile failure strain. After initial freezing of pore water, the residual unfrozen water is free to migrate under potential gradients, but it will freeze and (and expand) if it migrates into large cracks or cavities. Under high hydrostatic pressure, ice contained in pores will undergo phase transformation to polymorphs of higher density. If the ice content is high, this will produce significant strain discontinuities in the compressibility curve. Low-temperature strength is affected significantly by freezing, or ordering, of adsorbed water. In tests at 23 deg C, oven-dry rock is 35-40% stronger than air-dry rock contain ing maximum adsorbed water; when air-dry rock with maximum adsorbed water is cooled, strength below-70 deg is 35-40% higher than strength at 23 deg C. (See also W74-04346) (Knapp-USGS)

Group 2C—Snow, Ice, and Frost

SOIL FREEZING IN RELATION TO PORE WATER PRESSURE AND TEMPERATURE, Cornell Univ., Ithaca, N.Y.

R. D. Miller.

In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 344-352, 1973. 10 fig, 1 tab, 7 ref.

Descriptors: "Permafrost, "Frozen soils, "Freezing, Crystal growth, Mass transfer, Soil water movement, Permafrost, Thermodynamics, Cryology, "Pore water, "Pore pressure.

In studies of saturated soil, an ice-water interface behaved in a manner analogous to the behavior of an air-water interface in the same soil. A quantitative analysis of freezing of an unsaturated soil of very simple geometry was undertaken in order to establish a vision of the stages of progressive freezing in real soils of complex geometry. It provides a detailed rationale for the fact that, when moist soil freezes, profound changes in the water content occur: Water moves from unfrozen to frozen soil, whereby the pores of the frozen zones become saturated and adjacent ice-free soil is descitedd. Under the circumstances of interest, an adsorbed film of mobile water covers the surface of a mineral particle. This film exists between the mineral particle and air or ice with which the particle is in contact. The film will be thin, of the order of tens of angstrom units. Where two particles touch, whether mineral-ice or mineral-mineral contacts, there will be additional capillary water present, essentially unaffected by adsorption forces associated with the film. If one of the particles is ice, the ice-water interface will alter its shape by melting or freezing to achieve an equilibrium interface. (See also W74-04346) (Knapp-USGS)

IONIC MOBILITY IN PERMAFROST,

Cold Regions Research and Engineering Lab., Hanover, N.H. R. P. Murrmann.

In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 352-359, 1973. 8 fig, 2 tab, 20 ref.

Descriptors: *Permafrost, *Ion transport, *Water chemistry, *Pore water, Mass transfer, Soil moisture, Diffusion, Electrical conductance, Ice, Frozen soils, Frozen ground, Conductivity. Identifiers: *Ionic mobility.

The mobility of ions was studied in frozen earth materials. Although ion diffusion is slower in frozen soil than in unfrozen soil, values of the diffusion coefficients in the temperature range from about 0 to -15 deg C, are high relative to those of solid state diffusion. Although the rate of ion diffusion is lower in frozen silt soil than in frozen clay at a given temperature, it increases with clay content because of the decreasing tortuosity of the soil matrix. The most important parameter influencing ion diffusion in a given soil is tempera-ture, but the influence of temperature cannot be accounted for by the changing thermal energy of the ions. The temperature dependence for the low frequency electrical conductivity of frozen Na-bentonite is similar to that for ion diffusion. Unlike diffusion, the conductance of frozen bentonite clay increases with total water content of the sample. The enhanced conductivity is due to an in-creased number of charge carriers. The physical movement of ions through the frozen soil matrix and the relatively high values for diffusion coeffi-cients can be accounted for only by the existence of continuous, thin films of interfacial water in which the molecules are relatively mobile compared with those of ice. The temperature dependence of ion diffusion and electrical conductance largely results from a higher ion mobility as interfacial films of water thicken with melting. The increase in electrical conductivity with ice content indicates that the water at silicate-water-ice interfaces is more highly dissociated than the water at silicate-water-silicate interfaces. (See also W74-04346) (Knapp-USGS) W74-04382

SOUND AND SHOCK TRANSMISSION IN FROZEN SOILS.

Cold Regions Research and Engineering Lab., Hanover, N.H.

Planuver, N.P.. Y. Nakano, and N. H. Froula. In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 359-369, 1973. 10 fig, 2 tab, 47 ref.

Descriptors: *Frozen soils, *Soil physical properties, *Sound waves, Ultrasonics, Cryology, Elasticity(Mechanical), Compressibility. Identifiers: *Shock waves.

The behavior of frozen soils under shock compression was studied by the use of a gas-gun facility. The dilatational velocities of 20-30 Ottawa sand, Hanover silt, and Goodrich clay (fully water-saturated) are presented as a function of temperature. The measurements were made by one of the pulse-transmission methods based on transmitting a short train of 1-MHz pulses and measuring its first arrival time through a circular cylindrical specimen. Unfrozen water content is a major factor contributing to a variation of the dilatational wave velocity tends to decrease with ascending temperature. The role of unfrozen water in shear wave propagation is not as pronounced as it is on the dilatational wave. (See also W74-04346) (Knapp-USGS)

PRACTICAL EXTENSIONS TO A THEORY OF CONSOLIDATION FOR THAWING SOILS, Alberta Univ., Edmonton.

J. F. Nixon, and N. R. Morgenstern. In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 369-377, 1973. 9 fig, 9 ref.

Descriptors: *Permafrost, *Frozen soils, *Thawing, *Subsidence, *Consolidation, Ice, Soil mechanics, Pore pressure, Shear strength, Soil strength.

When frozen ground thaws, water is released and settlements develop as the water is squeezed from the ground. If the rate of generation of water exceeds the discharge capacity of the soil, excess pore pressures will develop, and these can lead to the failure of foundations and slopes. The one-dimensional theory of consolidation of thawing soils was extended to consider separately problems where the thaw depth is not simply proportional to the square root of time and problems where the change of void ratio of the soil bears a semilogarithmic relationship with the change in effective stress. Curves are presented for power law thaw depth-time relations. (See also W74-04346) (Knapp-USGS)

EXPERIMENTAL PRESSURE STUDIES ON FROST HEAVE MECHANISMS AND THE GROWTH-FUSION BEHAVIOR OF ICE, Continental Oil Co., Ponca City, Okla. F. J. Radd, and D. H. Oertle.

H. J. Radd, and D. H. Oertle. In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 377-384, 1973. 10 fig, 1 tab, 21 ref.

Descriptors: *Frost heaving, *Frozen soils, *Permafrost, *Crystal growth, *Freezing, Cryology, Ice, Laboratory tests, Pressure, Temperature, Porous media.

Experimental and theoretical studies were made of basic frost heave mechanisms. The P-T fusion curve for ice demonstrated non-Clapeyron behavior of pressure upon the solid in contact with its own unconfined liquid. This gave rise to pres-

sure effects on ice that were about 13 times larger than the predicted Clapeyron equation. Ice-lens growth was demonstrated for presures up to 182.81 kg/sq cm. Ice-lens formation is a special form of crystal growth which is common to many liquid-solid transformations accomplished in insoluble fine-particle host systems. (See also W74-04346) (Knapp-USGS) W74-04385

TRIAXIAL AND CREEP TESTS ON FROZEN OTTAWA SAND,

Cold Regions Research and Engineering Lab., Hanover, N.H. F. H. Sayles.

In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 384-391, 1973. 12 Fig, 12 Ref.

Descriptors: *Permafrost, *Soil tests, *Sands, *Frozen soils, Creep, Stress, Strain, Shear strength, Strength, Soil strength.

Triaxial compression tests using a constant rate of applied strain and triaxial creep tests using a constant load were conducted on saturated frozen Ot-tawa sand and ice to gain a better understanding of the factors that influence the strength and deformation characteristics of frozen soils. The re-sistance of saturated frozen Ottawa sand in a confined stress condition can be considered as con-sisting of the cohesion of the ice matrix and the frictional resistance of the sand grains. These sources of strength are nearly independent of each other when the applied rate of strain is greater than After the ice matrix has failed at a strain less than 0.01, the soil resistance becomes a function of the normal stress and the apparent angle of the in-ternal friction of unfrozen sand, about 30 deg. For a given temperature the initial or cohesive strength of the frozen sand increases with the rate of applied strain. The rate of increase in the initial shear partial strain. The rate of includes in the initial start strength of saturated frozen Ottawa sand and polycrystalline columnar-grained ice decreases with increasing confining pressure. At the higher confining pressures used in this investigation, the initial shear strength is nearly independent of confining pressure at rates of applied strain greater 0.02. The short-term (periods up to at least 100 h) creep strength of frozen Ottawa sand can be represented by Vyalov's strength equation. It is hypothesized that the long-term ultimate creep strength of saturated frozen sand with porosity of 37% or less is a function of the angle of internal friction of the sand, which could be determined through triaxial tests on unfrozen sand freely drained. (See also W74-04346) (Knapp-USGS) W74-04386

SAMPLE DISTURBANCE AND THAW CON-SOLIDATION OF A DEEP SAND PER-MAFROST,

Woodward-Lundgren and Associates, Oakland, Calif. W. S. Smith, K. Nair, and R. E. Smith.

In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 392-400, 1973. 3 fig, 8 tab, 5 ref.

Descriptors: *Frost heaving, *Thawing, *Permafrost, *Sampling, *Soil tests, Frozen soils, Soil properties, Freeze-thaw tests. Identifiers: Sample disturbance.

To evaluate the influence of possible sample disturbance effects on the thaw-consolidation behavior of permafrost, artificially frozen specimens were fabricated in the laboratory where positive control of disturbance effects was possible. Uniaxial thaw-consolidation tests were performed on both recovered permafrost cores and artificially frozen specimens. Undisturbed normally consolidated frozen sand specimens have only very small thaw strains in contrast to the 3-5 percent thaw strains measured on normally consolidated disturbed specimens. However, the

undisturbed underconsolidated specimen showed that significant thaw strains would occur if the sand specimens were not normally consolidated in the frozen state. Disturbance effects were found to be very significant. Knowledge of sample disturbance effects should lead to more economical designs for most situations. (See also W74-04346) (Knapp-USGS)

VISCOELASTIC PROPERTIES OF FROZEN SOIL UNDER VIBRATORY LOADS, Cold Regions Research and Engineering Lab., Hanover, N.H.

For primary bibliographic entry see Field 8D. W74-04388

PORE WATER AND HEAVING PRESSURES DEVELOPED IN PARTIALLY FROZEN SOILS,

DEVELOPED IN PARTIALL I PROZECT SOLLS, Glasgow Univ. (Scotland). H. B. Sutherland, and P. N. Gaskin. In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 409-419, 1973. 6 fig, 10 tab. 19 ref.

Descriptors: *Pore pressure, *Frost heaving, *Frozen soils, *Permafrost, Soil water, Soil moisture, Freezing, Frozen ground, Thawing, Pore water.

Pressures associated with a growing ice lens in a partially frozen soil were studied both theoretically and experimentally. Equations expressing these pressures were derived, and some experimental results supporting them were obtained. The equations were derived initially for uniform spheres, and assumptions have to be made when they are applied to soils. The maximum heaving pressures and the maximum drops in pore water pressure were measured for four soils and the pressure were measured for four soils, and the measured values compared with those predicted. (See also W74-04346) (Knapp-USGS)

SHEAR STRENGTH AT A THAW INTERFACE,

Alberta Univ., Edmonton. S. Thomson, and E. F. Lobacz.

In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 419-426, 1973. 9 fig, 4 tab, 11 ref

Descriptors: *Soil strength, *Permafrost, Thawing, Frozen soils, Frozen ground, Ice, Descriptors: Shear strength.

Laboratory shear tests were made on a remolded silty soil considered to be typical of those encoun-tered in permafrost areas. Strength characteristics, assessed by means of conventional laboratory assessed by means of conventional abotators, tests, were compared with strengths observed in direct shear tests in which a frozen-thawed interface coincided with the shear plane imposed by the direct shear apparatus. Information was obtained from undrained and drained triaxial tests on thawed samples. Strength loss is primarily due to moisture accumulation, including that from melt-ing ice lenses, and to structural changes in the soil mass caused by the freezing process. (See also W74-04346) (Knapp-USGS) W74-04390

GROUNDWATER INVESTIGATIONS IN PER-MAFROST REGIONS OF NORTH AMERICA: A REVIEW

REVIEW, Geological Survey, Boston, Mass. For primary bibliographic entry see Field 2F. W74-04391

EFFECTS OF PERMAFROST ON STREAM FLOW CHARACTERISTICS IN THE DISCONTINUOUS PERMAFROST ZONE OF CENTRAL

ALASKA, Dubois and King, Inc., Randolph, Vt. S. L. Dingman.

In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 447-453, 1973, 10 fig. 3

Descriptors: *Permafrost, *Surface-groundwater relationships, *Overland flow, *Alaska, *Arctic, Base flow, Hydrology, Frozen ground, Water

The presence of permafrost in the watershed of Glenn Creek, Alaska, is a major influence on the behavior of the stream, but this influence is rather indirect. Its most important roles are in supporting a high water table beneath the valley bottom area, so that overland flow derived from standing water in this area dominates the hydrograph rise and peak; restricting groundwater flow to the stream; peak; restricting groundwater flow to the stream; and, providing an impermeable surface beneath the moss on the north facing slopes, over which water infiltrating the moss flows to the stream to dominate the hydrographic recession. (See also W74-04346) (Knapp-USGS)

GROUNDWATER PORE PRESSURES ADJACENT TO SUBARCTIC STREAMS,

JACENT 10 Subarce:
Alaska Univ., College.
D. L. Kane, R. F. Carlson, and C. E. Bowers.
In: International Conference on Permafrost 2nd,
Yakutsk, USSR, 1973, p 453-458, 1973. 5 fig, 8 ref.

Descriptors: *Surface-groundwater relationships, *Permafrost, *Ice, *Pore pressure, *Arctic, Freez-ing, Frozen ground, Frozen soils. Identifiers: Aufeis.

Two distinct flow conditions exist in the subarctic streams. During the ice-free periods open channel flow occurs, and, when ice conditions exist, closed conduit flow occurs. In the soil system, the downward freezing of the seasonal frost forms an impermeable barrier when the freezing front coincides with the unfrozen water. The combination of the aufeis and the saturated seasonal frost zone acts as the thin overlying confining layer. Movement of groundwater into the stream bank during the winter period results in a higher groundwater the winter period results in a higher groundwater, surface than exists during summer. By early June, this water is discharged into the stream when the open channel conditions again exist. If during the winter there is a net increase in bank storage along the entire stream, then the major source of streamflow is from subpermafrost groundwater. Movement of water down the stream channel decreases during the winter for two reasons. First, the quantity of water reaching the stream and adjacent aquifer from surface sources decreases during the winter because precipitation is being stored on ground surface as snow. Second, a reduction in the cross-sectioned area of unfrozen water occurs in the channel as a result of downward freezing. This restriction of flow causes higher pressures in the stream that result in water flowing onto the surface. This water then freezes and is stored until spring breakup. (See also W74-04346) (Knapp-USGS) W74-04393

RECHARGE OF A CENTRAL ALASKA LAKE BY SUBPERMAFROST GROUNDWATER, Alaska Univ., College. For primary bibliographic entry see Field 2F. W74-04394

RISK OF UNCONTROLLED FLOW FROM WELLS THROUGH PERMAFROST, Cold Regions Research and Engineering Lab., Hanover, N.H.

For primary bibliographic entry see Field 2F. W74-04395

GROUNDWATER SUPPLY FOR AN OIL
MP NEAR PRUDHOE BAY, ARCTIC A GROU CAMP I ALASKA, Metcalf and Eddy, Inc., Boston, Mass.

For primary bibliographic entry see Field 2F. W74-04396

THE NATURE OF THE SEAWATER-FRESH-WATER INTERFACE DURING BREAKUP IN THE COLVILLE RIVER DELTA, ALASKA, Louisiana State Univ., Baton Rouge.

In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 473-476, 1973. 3 fig, 1 tab, 12 ref. ONR Contract N00014-69-A-0211-0003.

Descriptors: *Permafrost, *Ice breakup, *Saline water-freshwater interfaces, *Saline water intru-sion, *Arctic, *Alaska, Deltas, Ice jams, Rivers, Identifiers: Colville River(Alaska).

Permafrost in combination with the seasonal remarks in combination with the seasonal freezing of the upper layers of all surface water results in the virtual cessation of flow in many arc-tic rivers and the replacement of the freshwater tic rivers and the replacement of the freshwater beneath the ice by seawater in their lower reaches. During the period of flooding in spring, seawater is replaced by floodwater that progresses seaward as a wedge beneath the sea ice. The freshwater-sea-water interface that develops remains sharp as the floodwater advances. In 1971, the position and na-ture of the interface that developed off the Colville Delta in Alaska was established with a salinome-ter and the volume of displaced seawater was calter, and the volume of displaced seawater was cal-culated for the period of breakup flooding. Through the first 14 days of river flow, the Inrough the 11rst 14 days of river flow, the discharge was 4640 million cu m. During the last 5 days of the flood season, discharge totaled 1060 million cu m. Thus, the total for the flood period was 5700 million cu m. This amount was 58% of the total discharge for 1971. (See also W74-04346) (Knapp-USGS) W74-04397

MAPPING AND PREDICTING PERMAFROST IN NORTH AMERICA: A REVIEW, 1963-1973, Geological Survey, Menlo Park, Calif.

O. J. Ferrians, Jr., and G. D. Hobson. In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 479-498, 1973. 217 ref.

Descriptors: *Permafrost, *Mapping, Construc-Descriptors: "Permatrost, "Mapping, Construc-tion, "Reviews, Subsidence, Ice, Frozen ground, Frozen soils, Geophysics, Surveys, Hydrogeolo-gy, Soil moisture, Geomorphology, Remote sensing, Data collections, Seismic studies, Re-sistivity, "Bibliographies.

Methods of mapping and predicting permafrost are reviewed. The discussion is divided into two broad reviewed. The discussion is divided into two broad categories, the traditional methods and the geophysical methods. In practice the two catego-ries overlap, and optimum results can be achieved only by utilizing aspects of both. To determine the best method or methods to use for a specific investigation, several factors must be considered-the most important of which are type and detail of information required, amount of area to be covered, complexity of the natural physical condi-tions in the area, and time and money available for the study. Of primary concern to engineering in permafrost areas are the character of the per-mafrost soils and the way in which a proposed structure (building, pipeline, and road) and these soils would interact. Wherever possible, areas that are underlain by ice-rich permafrost should be avoided for most engineering projects; otherwise structures must be designed to accommodate the ice-rich condition of the natural foundation material, and special construction techniques acceptable for permafrost areas must be used. These minations are necessary in order to make intel-ligent land use assignments, to find and develop groundwater supplies, to plan and achieve effective waste-disposal systems, and to expeditiously explore for and develop mineral, coal, petroleum, and natural gas resources. (See also W74-04346) (Knapp-USGS) W74-04398

Group 2C-Snow, Ice, and Frost

IN SITU PHYSICOMECHANICAL PROPERTIES OF PERMAFROST USING GEOPHYSICAL TECHNIQUES, Iron Ore Co. of Canada, Schefferville (Quebec).

O. P. Garg.

In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 508-516, 1973. 3 fig, 7 tab,

Descriptors: *Permafrost, *Frozen ground, *Borehole geophysics, Seismic studies, Electrical studies, Electrical resistance, Resistivity, Porosity, Data collections, *Canada.

Seismic refraction surveys using a multichannel seismograph and resistivity roundings using a de portable unit were used to determine the depth of the permafrost table and the base of frozen ground. The depth of penetration achieved in delineating the bottom of permafrost depends on the resistivity contrasts between different layers and the structural and lithological complexities of the area. The resistivity penetration achieved in the Schefferville area of Quebec was the order of 80 m. (See also W74-04346) (Knapp-USGS)

ELECTROMAGNETIC PROBING OF PER-

MAFROST, Cold Regions Research and Engineering Lab., Hanover, N.H.

P. Hoekstra, and D. McNeill.

In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 517-526, 1973. 10 fig, 1

Descriptors: *Permafrost, *Electrical studies, *Magnetic studies, *Geophysics, *Remote *Magnetic studies, *Geophysics, *Re sensing, Surveys, Mapping, Data collections. Identifiers: *Electromagnetic surveys.

In permafrost, three important objectives can be derived from ground resistivity: measurement of depth of permafrost; mapping of frozen sections in areas of discontinuous permafrost; and mapping of high-ice-content ground. The potential applications of ground and airborne low frequency electromagnetic sensors to map the electrical resistivity of ground are described. There are no apparent technological obstacles in applying two electromagnetic survey methods, the measurement of wave tilt and the measurement of coupling wave tilt and the measurement of coupling between two loop antennas, to permafrost problems. The theory is well developed, and equipment design has probably reached a satisfac-tory level. (See also W74-04346) (Knapp-USGS)

THE APPLICATION OF SHALLOW SEISMIC METHODS TO MAPPING OF FROZEN SURFICIAL MATERIALS, Geological Survey of Canada, Ottawa (Ontario).

ln: International Conference on Permafrost 2nd, Yakutsk, USSR 1973. p 527-534, 1973. 10 fig, 8 ref.

Descriptors: *Permafrost, *Seismic studies, *Mapping, Geophysics, Data collections, Frozen soils, Frozen ground, *Canada.

Shallow refraction seismic methods were success fully applied to permafrost studies. Conventional instrumentaion used in shallow prospecting can be applied to permafrost in summer or winter for a rapid, economical survey. Refraction spreads are generally much longer than those in permafrost-free areas to obtain the necessary depth informa-tion. The refraction method may be used to map the occurrence of permafrost in the discontinuous zone under summertime conditions where a thawed active layer is present, because about a meter of seasonal frost at surface in winter restricts the use of refraction methods. Structure within permafrost can be mapped with the refraction technique in conjunction with borehole con-trol for seismic velocities. Massive ice lenses have been delineated at depth. Marine refraction seismic methods may be used to map the occurrence of permafrost under the sea bottom. Anomalous attenuation of refracted waves was observed in regions of thin permafrost. This phenomenon may be associated with refraction of seismic waves in a thin high-speed surface layer. (See also W74-04346) (Knapp-USGS)

INVESTIGATION OF SAMPLING PERENNI-ALLY FROZEN ALLUVIAL GRAVEL BY CORE DRILLING,

ons Research and Engineering Lab., Cold Regi Hanover, N.H. G. R. Lange.

In: International Conference on Permafrost 2nd, Yakutsk, USSR 1973. p 535-541, 1973. 2 fig. 1 tab,

Descriptors: *Permafrost, *Core drilling, *Drilling Sampling, Frozen ground, Frozen soils,

Excellent cores of frozen gravel and frozen, fractured, and weathered rock at near freezing ground temperatures may be taken by circulating a liquid drilling fluid chilled to temperatures just below the ground temperature, even in summer weather, if the material is well bonded by ice. Compressed air is not feasible for core drilling untilthe ambient air temperature reaches 4 deg C or cooler. Excellent quality cores as small as 70 mm were consistently taken. Borehole wall stabilization was satisfactorily achieved with the chilled liquids, except where the walls were not well bonded by ice. (See also W74-04346) (Knapp-USGS) W74-04402

POTENTIAL USE OF AIRBORNE DUAL-CHAN-NEL INFRARED SCANNING TO DETECT MAS-SIVE ICE IN PERMAFROST,

Development and Resources Transportation Co., Silver Spring, Md. For primary bibliographic entry see Field 7B. W74-04409

ENGINEERING DESIGN AND CONSTRUCTION IN PERMAPROST REGIONS: A REVIEW, Cold Regions Research and Engineering Lab., Hanover, N.H.

For primary bibliographic entry see Field 8D. W74-04404

WATER SUPPLY AND WASTE DISPOSAL CONCEPTS APPLICABLE IN PERMAFROST REGIONS.

Alaska State Dept. of Environmental Conservation, Fairbanks.
For primary bibliographic entry see Field 5D.
W74-04405

SOME PASSIVE METHODS OF CONTROLLING GEOCRYOLOGICAL CONDITIONS IN ROADWAY CONSTRUCTION, Cold Regions Research and Engineering Lab., Hanover, N.H.

R. L. Berg, and G. W. Aitken.

In: International Conference on Permafrost 2nd, Yakutsk, USSR 1973. p 581-586, 1973. 5 fig, 2 tab,

Descriptors: *Permafrost, *Subsidence, *Frost heaving, *Road construction, Arctic, *Alaska, Thawing, Freezing, Insulation, Cryology.

The most effective technique for controlling permafrost degradation under roads was that of painting the pavement surface white. Performance of a baled peat heat sink was not satisfactory and this approach should probably not be considered in an area having a thermal regime similar to that at Fairbanks. Two different heat transfer computational techniques are applicable in evaluating thermal designs in permafrost areas. The finite dif-ference technique should have more widespread application because of the flexibility it provides with regard to specification of boundary and initial conditions. (See also W74-04346) (Knapp-USGS) W74-04406

ENVIRONMENTAL CONSIDERATIONS FOR THE UTILIZATION OF PERMAPROST TER-

Cold Regions Research and Engineering Lab., Hanover, N.H.

In: International Conference on Permafrost 2nd. Yakutsk, USSR 1973. p 587-590, 1973. 1 fig, 21 ref.

Descriptors: *Permafrost, *Subsidence, *Erosion, *Environmental effects, Highway effects, Arctic, Vegetation effects, Frail lands.

Current utilization of the permafrost landscape is still relatively low as a result of its vastness, remoteness and inaccessibility, and low population usages. However, where population and in-dustrial centers do exist, the solutions of problems caused by the presence and potential degradation of permafrost are expensive. Frequently, symptoms of permafrost degradation occur regardless of the care exercised to avoid them. These changes are characteristically generated at the ground surface as the energy exhange processes are modified; however, these surface effects are transferred into the permafrost. Unsightly vehicle impressions across the uninhabited tundra may be acceptable to some, but an accelerated and headward eroding channel resulting from a poorly designed facility, road, or entrenched vehicle trail is no longer tolerated. The definition of that fine line between permissible and nonpermissible use of the permafrost terrain, both in time and space, should prove to be an excellent point of discussion and cooperation between Northern American, Soviet, and other researchers and planners. (See also W74-04346) (Knapp-USGS) W74-04407

SETTLEMENT ASSOCIATED WITH THE THAWING OF PERMAFROST,

Cold Regions Research and Engineering Lab., Hanover, N.H.

In: International Conference on Permafrost 2nd, Yakutsk, USSR 1973. p 599-607, 1973. 10 fig, 1 tab, 11 ref, append.

*Subsidence. *Thawing. Descriptors: *Permafrost, *Moisture content, Porosity, Frost heaving, Strain, Freezing, Frozen ground, Frozen soils, *Arctic, Soil mechanics.

A direct, simple and accurate method is given for predicting the settlements associated with the thawing of permafrost, using the water content and dry unit weight of undisturbed samples of the frozen ground. The relationships between water content and dry unit weight of saturated frozen and thawed soils are discussed. When the soil is saturated, the potential settlement on thawing can be easily assessed, using only the water content of disturbed or undisturbed samples of the frozen soil. A settlement prediction method can be readily integrated with thermal prediction methods in determining the rate of settlement and strength of thawing soils with respect to time. (See also W74-04346) (Knapp-USGS) W74-04408

CONTROL OF PERMAFROST DEGRADATION BENEATH A ROADWAY BY SUBGRADE INSU-LATION

LATION, Alaska State Dept. of Highways, College. For primary bibliographic entry see Field 4C. W74-04409

Snow, Ice, and Frost—Group 2C

THERMAL. REGIME IN AN ARCTIC EARTHFILL DAM, Cold Regions Research and Engineering Lab., Hanover, N.H.

For primary bibliographic entry see Field 8D. W74-04410

CONTROL OF CULVERT ICING, Cold Regions Research and Engineering Lab., Hanover, N.H. For primary bibliographic entry see Field 4C. W74-04411

ANALYSIS OF THE PROPOSED LITTLE CHENA RIVER, EARTHFILLED NONRETEN-TION DAM, FAIRBANKS, ALASKA, Corps of Engineers, Anchorage, Alaska. For primary bibliographic entry see Field 8D. W74-04412

SOME EFFECTS OF SURFACE DISTURBANCE ON THE PERMAFROST ACTIVE LAYER AT INUVIK, N.W.T., CANADA, Geological Survey of Canada, Ottawa (Ontario). For primary bibliographic entry see Field 4C.

W74-04413

CORPS OF ENGINEERS TECHNOLOGY RE-LATED TO DESIGN OF PAVEMENTS IN AREAS OF PERMAFROST,

Corps of Engineers, Washington, D.C. For primary bibliographic entry see Field 4C. W74-04414

PERMAFROST PROTECTION FOR PIPELINES, Esso Production Research Co., Houston, Tex. H. O. Jahns, T. W. Miller, L. D. Power, W. P. Rickey, and T. P. Taylor. In: International Conference on Permafrost 2nd, Yakutsk, USSR 1973. p 673-684, 1973. 13 fig, 3 tab, 23 ref.

Descriptors: *Permafrost, *Oil fields, *Pipelines, *Thawing, Insulation, Frozen ground, Frozen soils, Arctic, *Alaska. Identifiers: *Heated pipelines.

Pipeline operations in permafrost regions are faced with unique problems that arise from disturbances of the thermal regime in the ground. The thawing of ice-rich soil can result in a loss of adequate pipeline support. The conventional bu-ried pipeline mode may be inadequate in these soils, particularly if the pipeline is to be operated at temperatures above the freezing point. Insulation placed around a warm buried pipeline is an efficient means of reducing heat transfer to the ground and, consequently reducing the rate of thaw. In cold permafrost, insulation alone can prevent the formation of a permanent thaw plug around the pipeline. Insulation and other passive protection systems for a warm buried pipeline tend to become very bulky in warm permafrost if no thawing is to be allowed below the line. Mechanical refrigeration can provide complete permafrost protection below an insulated buried pipeline under all climatic conditions of interest. Refrigeration rates required in such a system are not excessive. Thermal piles equipped with natural convection devices for heat removal during winter can be designed to prevent permafrost degradation around pile supports for an elevated pipeline. Both single-phase and two-phase closed systems are available for this purpose. In large-diameter piles, an open air convection system can also be used. Temperatures at the pile-soil interface may rise to near the freezing point during the summer when the thermal pile is inactive. White paint and insula-tion can offer permafrost protection for gravel berms. (See also W74-04346) (Knapp-USGS) W74-04415

ENGINEERING PERMAFROST-RELATED GEOLOGY PROBLEMS POSED BY THE TRANS-ALASKA PIPELINE, Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 8D. W74-04416

LONG-TERM EFFECTS OF VEGETATIVE COVER ON PERMAFROST STABILITY IN AN AREA OF DISCONTINUOUS PERMAFROST, Cold Regions Research and Engineering Lab., Hanover, N.H. For primary bibliographic entry see Field 4C. W74-04417

STABILITY OF AN UNDERGROUND ROOM IN FROZEN GRAVEL, Bureau of Mines, Spokane, Wash.

In: International Conference on Permafrost 2nd, Yakutsk, USSR 1973. p 699-706, 1973. 6 fig, 1 tab,

Descriptors: *Mining, *Permafrost, *Gravels, *Frozen ground, *Alaska, Thawing, Subsidence, Freezing, Soil mechanics.

The economic and technological practicability of mining gold from buried frozen gravel placers in Alaska was investigated. In Fairbanks, Alaska, the normal maximum temperatures are below freezing from November through March and, therefore, from November through March and, therefore, above freezing during April through October. For 5 months of the year (November through March), an underground room in permafrost gravel at a depth of 15-30 m, 3 m high by 9 m wide by any length (21.3-m length in test), remained open without artificial support. Most rock falls occur within a few days after the opening is excavated, and occasional slabs develop, particularly around silt lenses. Rock falls can be minimized by ex-cavating a smooth roof such as that produced with a continuous miner or with smooth-wall blasting. A possible method of portal support for operation during the winter months only (November through March) would be continuous support (such as corrugated metal pipe through the active layer), then a sealing off of the portal from April through October. This system would rely on the natural permafrost temperature for mine support during the summer months assuming no work during this period, and supercooling the mine during the winter months with natural cold air. For yearround operations, the most satisfactory method of ground support would be to keep the ground frozen by maintaining the air temperature in all working areas at 3.9 deg C or lower. Circulation of such cold, dry air would aggravate the sublimation problem and increase the frequency of gravel falling from the roof. To attempt operations during the warm months without refrigeration (using warm air ventilation), continuous support throughout the working and access areas is perative. (See also W74-04346) (Knapp-USGS) W74-04418

A SEWAGE-TREATMENT CONCEPT FOR PERMATROST AREAS, Cold Regions Research and Engineering Lab., Hanover, N.H. For primary bibliographic entry see Field 5D. W74-04419

ENCOUNTERING MASSIVE GROUND ICE DURING ROAD CONSTRUCTION IN CENTRAL ALASKA,

Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 4C.
W74-04420

THE USE OF POLYURETHANE FOAM PLASTICS IN THE CONSTRUCTION OF EX-

PEDIENT ROADS ON PERMAFROST IN CEN-TRAL ALASKA,
Cold Regions Research and Engineering Lab.,
Hanover, N.H.

For primary bibliographic entry see Field 8G. W74-04421

EFFECTS OF GROUND-ICE VARIABILITY AND RESULTING THAW SETTLEMENTS ON BURIED WARM-OIL PIPELINES, Mackenzie Valley Pipeline Research Ltd., Calgary (Alberta).

For primary bibliographic entry see Field 4C. W74-04422

PERFORMANCE OF A WARM-OIL PIPELINE BURIED IN PERMAFROST, Mackenzie Valley Pipeline Research Ltd., Calgary

For primary bibliographic entry see Field 8D. W74-04423

LIME DISINFECTION OF SEWAGE BACTERIA AT LOW TEMPERATURE.

Colorado State Univ., Fort Collins. Dept. of Microbiology.
For primary bibliographic entry see Field 5D.
W74-04548

RADIO DEPTH-SOUNDING ON MEIGHEN AND BARNES ICE CAPS, ARCTIC CANADA, Department of the Environment, (Ontario). Inland Waters Directorate. Ottawa.

Scientific Series No 25, 1972. 13 p, 9 fig, 4 tab, 18

Descriptors: *Sounding, *Glaciers, *Canada, *Arctic, *Radar, Glaciology, Ice, Depth. Identifiers: Barnes Ice Cap, Meighen Ice Cap.

Depth measurements through Meighen Ice Cap, Meighen Island, and Barnes Ice Cap, Baffin Island, were obtained by using a 35 MHz radio echo sounder. By comparison with a known borehole depth on Meighen, the velocity of the radio waves in the ice was calculated to be 178 plus or minus 2 m per microsec. The minimum depth that could be sounded was 90 m. On Barnes Ice Cap, the velocity was measured by a wide angle reflection technique as 168 plus or minus 2 m per microsec, and continuous photographic recording of the depth was obtained. Estimates of absorption in the ice from attenuator settings of the echo sounder were significantly greater than previously published values. (Knapp-USGS) W74-04571

EFFECTS OF STRATIGRAPHIC LAYERS ON WATER FLOW THROUGH SNOW,

Cold Region Research and Engineering Lab., Hanover, N.H. S. C. Colbeck.

Research Report 311, September 1973. 15 p, 5 fig,

Descriptors: *Snowpacks, *Snowmelt, *Unsaturated flow, Saturated flow, Porous media, Ice, Snow, *Melt water, Drainage, Percolation.

The flow of water through layered snowpacks is discussed. The difference in permeability of layers required to cause large flow diversions is quite small. The effect of slope is large even at small angles. Large variations in the properties of layers in snowpacks occur in time and space. The propagation of values of volume flux (or effective-w saturation) through a snowpack can be predicted for an unsaturated snowpack of any layered composition. The propagation of a known waveform throughout the snowpack can be predicted by con-structing as many of the characteristics as necessary (by assuming that no shock front occurs) and

Group 2C-Snow, Ice, and Frost

then using the conservation of mass to locate the then using the conservation of mass to locate the position of the shock front. When accumulation of water above a less permeable layer produces a perched water table, lateral flow along the layer is likely. In this case, flow at the local scale is considered two-dimensional. In view of the rapid deterioration of ice layers during intense melting, the treatment of these layers as porous media is reasonable. Direct infiltration and lateral flow both increase with the thickness of the water layer, and the relative importance of the lateral mode of flow increases with the thickness of the water layer. For typical values of these parameters, the ratio of flow along the layer to flow through the layer in-creases by an order of magnitude when the angle of slope increases from 0 deg to 10 deg. (Knapp-USGS) W74-04572

AN ANALYTICAL STUDY OF A COILED-PIPE

Cold Regions Research and Engineering Lab., Hanover, N.H. For primary bibliographic entry see Field 8B. W74-04589

QUICKCLAYS AS PRODUCTS OF GLACIAL ACTION: A NEW APPROACH TO THEIR NA-TURE. GEOLOGY. DISTRIBUTION AND GEOTECHNICAL PROPERTIES, Leeds Univ. (England). Dept. of Civil Engineering.

For primary bibliographic entry see Field 2G.

THE WATER BALANCE IN ARCTIC AND SUB-ARCTIC REGIONS-ANNOTATED BIBLIOG-RAPHY AND PRELIMINARY ASSESSMENT, Cold Regions Research and Engineering Lab., Hanover, N.H.

S. L. Dingman. Special Report 187, June 1973. 131 p, 2 fig, 294 ref. Army Project 4A062112A89420.

Descriptors: * Arctic, *Water balance. Descriptors: "Arctic, "Water balance, "Bibliographies, Abstracts, Areviews, Hydrologic cycle, Glaciers, Glaciation, Evapotranspiration, Groundwater, Hydrogeology, Precipita-tion(Atmospheric), Runoff, Streamflow.

Definitions and boundaries of the arctic and subarctic are reviewed; a map showing these boundaries and annotations of a number of publications dealing with this problem are also presented. A bibliography includes several hundred reports that directly discuss elements of the water balance in arctic and subarctic regions. These annotations are grouped by geographic area: the Northern Hemi-sphere, Europe, the U.S.S.R., Alaska, Canada, and Greenland and Iceland. For each area, annotations are presented according to water-balance ele-ments: precipitation, evapotranspiration, runoff, streamflow, groundwater contributions to runoff, and changes in glacial storage. A subsequent section gives annotations of articles on the water balance of the Arctic Ocean. This is followed by a brief assessment of the state of knowledge on the water-balance elements in each geographic region. This bibliography is intended to be complete for the period 1950-1971 (some earlier articles are included), especially for articles published in English. A large number of items from the Russian and European literature are included, but the bibliography is probably less complete for these. A total of 688 annotations is included; many articles are annotated in more than one section, as they include information on more than one water-balance element or more than one geographic area. (Knapp-USGS) W74-04601

SURGLACIAL DEVELOPMENT OF CHLOREL-LA IN BAIKAL, (IN RUSSIAN), Irkutskii Gosudarstvennyi Universitet (USSR).

For primary bibliographic entry see Field 2H.

W74-04647

STRIATED GROUND, A TYPE OF PATTERNED GROUND IN THE PERIGLACIAL AREA OF THE VENEZUELAN ANDES, (IN SPANISH), Instituto Venezolano de Investigaciones tificas Caracas For primary bibliographic entry see Field 2G. W74-04651

POLLUTED SNOW IN SOUTHERN NORWAY **DURING THE WINTERS 1968-1971,** Oslo Univ. (Norway). Zoological Lab. For primary bibliographic entry see Field 5B. W74-04652

ICE ENGINEERING-SUMMARY OF ELASTIC PROPERTIES RESEARCH AND INTRODUCTION TO VISCOELASTIC AND NONLINEAR ANALYSIS OF SALINE ICE, Naval Civil Engineering Lab., Port Hueneme,

Calif. M. G. Katona, and K. D. Vaudrey

Available from NTIS, Springfield, Va. 22151 AD-768 279; Price \$3.50 printed copy; \$1.45 microfiche. Technical Report R797, August 1973. 71 p, 38 fig, 1 tab, 21 ref, append.

Descriptors: *Sea ice, *Elastic theory, Elastic deformation, Cryology, Ice, *Ice loads, Strength of materials, Structural design, Elasticiof materials, ty(Mechanical). Identifiers: *Saline ice.

Techniques used to analyze the behavior of sea ice are reviewed. Studies on elastic behavior are reviewed with emphasis placed on plate analysis. Classical plate theory and the finite element method are compared in analyzing ice plates, with special attention given to sea-ice airfields. Because elastic analysis is not totally representative of actual ice behavior, a general formulation is presented which gives the assumptions and procedures for both viscoelastic and nonlinear domains of sea-ice behavior. A laboratory program was initiated to determine material properties that are necessary to extend sea-ice analysis into the inelastic range. (Knapp-USGS) W74-04793

EFFECTS OF SALT CONCENTRATION CHANGES DURING FREEZING ON THE UNFROZEN WATER CONTENT OF POROUS MATERIALS,

Cold Regions Research and Engineering Lab., Hanover, N.H. A. Banin, and D. M. Anderson.

Water Resources Research, Vol 10, No 1, p 124-128, February 1974, 4 fig. 2 tab, 12 ref.

Descriptors: *Freezing, *Saline water, *Porous media, *Frozen soils, Frozen ground, Permafrost, Frost, Soil water, Aqueous solutions, Equations,

By combining equations for salt concentration by water removal from porous bodies with those for freezing point depression in normal solutions, equations were developed for calculating freezing point depression shifts due to the gradual removal of water upon freezing in porous bodies. The same equations can be used for the calculation of shifts in the osmotic potential of the water in drying porous bodies by using a simple conversion factor. Graphs relate the remaining water content to the freezing point shift for various initial soluble salt contents. Good agreement was found between the measured freezing point depression in a silty clay soil treated with three concentrations of sodium chloride and with dimethyl sulfoxide at various contents of unfrozen water and the calculated values. (Knapp-USGS) WATER FLOW THROUGH SNOW OVERLY-ING AN IMPERMEABLE BOUNDARY, Cold Regions Research and Engineering Lab.,

Hanover, N.H. S. C. Colbeck.

Water Resources Research, Vol 10, No 1, p 119-123, February 1974. 3 fig, 14 ref.

*Snowpacks, *Melt water,
*Unsaturated flow, Infiltration, Descriptors: Percolation, yield, Temperature. Snowmelt. Water Glaciohydrology, Melting, Mathematical models.

A two-layer model describes water flow over an impermeable boundary. The model consists of vertical flow through an unsaturated layer and flow along a boundary in a saturated layer. The governing equations are solved for the nonsteady case, where the gradient of the thickness of the saturated layer is small compared with the slope of the impermeable boundary. In most cases the discharge from shallow snowpacks will preserve the diurnal cycles of input at the surface, although for deep snowpacks (such as temperate glacier firn) the diurnal cycle is smoothed and only longterm responses are expected. The flow of a diurnal meltwater wave through a small (2.10 m deep by 100 m long) snowpack was calculated as an example. The case of steady flow is also described. (Knapp-USGS) W74-04803

2D. Evaporation and Transpiration

SOLAR ENERGY FOR THE CONCENTRATION OF PULP MILL EFFLUENTS, Commonwealth Scientific and Industrial Research

Organization, Melbourne (Australia). Div. of Chemical Engineering. For primary bibliographic entry see Field 5D.

W74-04544

MODELING OF TURBULENT TRANSPORT IN THE SURFACE LAYER,

National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center. G. L. Smith.

Available from NTIS Springfield, Va. 22151 NASA TN D-7306, copy price, \$3.00 domestic, \$5.50 foreign; \$1.45 microfiche. Technical Note D-7306, December 1973. 33 p, 1 fig, 15 ref.

Descriptors: *Turbulence, *Mixing, *Winds, *Evapotranspiration, Mass transfer, Convection, Dispersion, Turbulent flow, Model studies.

Atmospheric turbulence is sufficiently important to warrant computation of a set of general constants. Donaldson's equations are simplified for the large Reynolds numbers characteristic of atmospheric turbulence. Also, the turbulent Prandtl number is introduced into the model. The boundary conditions suitable for a rough surface (e.g., grass, forest, or city) are considered, and heuristic arguments are given for a set, which is selected.

The equations are then solved for a neutrally stable atmosphere (no vertical heat flux), thereby resulting in the familiar logarithmic wind profile. This serves three purposes: The suitability of the governing equations is verified; the suitability of the boundary conditions is verified; and two constants in the method are evaluated for atmospheric application. Next the case of stable stratification above the influence of the surface roughness is treated. From this study comes a mixing length appropriate to the stable layer. This length can be used to determine the point above which the mixing length becomes constant. Finally, the free-convection or unstable case, in which turbulence is thermally produced, is considered. (Knapp-USGS) W74-04795

Streamflow and Runoff—Group 2E

2E. Streamflow and Runoff

MATHEMATICAL MODELING OF STREAM STORAGE POTENTIAL, Arkansas Univ., Fayetteville. Water Resources

Research Center.

Available from National Technical Information Service as PB-228 021 \$3.75 in paper copy, \$1.45 in microfiche. Publication No 17, December 1973. 59 p. 12 fig. 27 ref. 2 append. OWRR B-015-ARK(1).

Descriptors: Streamflow, Hydrology, Reservoirs, Water supply, Equations, *Mathematical models, *Storage requirements, Management, Resources development, Engineering, planning, Runoff, *Arkansas, *Hydrologic data.
Identifiers: *Moran's model(Dams).

Streamflow data from unregulated streams in Arkansas were processed through Moran's Model for a dam. The process involved calculating a cumulative gamma distribution for each stream as the streamflow values were incremented in units of 0.1 cubic feet per second per square mile of drainage area. This gamma distribution was then used as input for Moran's Model. The output from Moran's Model includes the probability of the reservoir having zero contents as the size of the reservoir is decreased. The logarithm of the probability of zero contents, In Po, versus reservoir size, K, is a straight line of the form ln Po = -n-sK. The constants in the equation, n and s, are func-tions of the logarithm of the draft when the draft is expressed as a percentage of mean annual flow. The equations for In Po versus K were determined for each stream studied. In addition, a general equation for all streams was determined. W74-04305

MULTI-DIMENSIONAL ASPECTS OF EDDY DIFFUSION DETERMINED BY DYE DIFFU-SION EXPERIMENTS IN COASTAL WATERS

(SUMMARY), Loyola Univ., Los Angeles, Calif. For primary bibliographic entry see Field 2L. W74-04322

HARMONIC GENERATION OF SHALLOW WATER WAVES OVER TOPOGRAPHY, Florida State Univ., Tallahassee. Geophysical Fluid Dynamics Inst.

J. Lau, and A. Barcilon. Journal of Physical Oceanography, Vol 2, No 4 p

405-410, October 1972. 2 fig, 10 ref

Descriptors: *Shallow water, *Waves(Water), Topography, *Coasts, *Energy transfer, Reflec-Identifiers: Nearshore.

The reflection and nonlinear interaction between the first and second harmonics of a two-dimensional Boussinesq wavetrain was investigated. Effects of topography are included, the depth departing from a constant in a finite region. It is found that topography can speed up or retard energy transfer between first and second harmonics. The reflection coefficient in the present context is sig-nificantly different from the one obtained by using linear theory. This is partly due to partitioning of energy between harmonics. Two examples were studied and the results show that for long-scale topography the rate of harmonic generation depends upon the local depth which affects the detuning and thus the energy transfer between the first and second harmonics. When wave-scale and subwave-scale variations are found, reflection plays an important part. There is a competition for the partitioning of energy between reflection and harmonic generation. (Sinha-OEIS) W74-04323 PHYSICAL AND DYNAMICAL SCALES FOR GENERATION OF WIND WAVES, Hydronautics, Inc., Laurel, Md. J. Wu.

J. Wu. Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol 98, No WW2, Proceedings paper 8879, p 163-175, May 1972. 5 fig, 28 ref, 2 append.

Descriptors: *Wind velocity, Waves(Water), *Ocean waves, *Energy transfer, *Fetch.
Identifiers: *Wind waves, *Wave generation, Airflow patterns. Air-sea interaction

An analysis is given of relevant physical scales on which coupling takes place between long and short waves, and dynamic scaled for coupling of wind and waves, in the generation of wind waves. Based on these scales and on a separation criterion, it is on these scales and on a separation of the first argued that the airflow separates from dominant waves in the laboratory and from ripples superimposed on dominant waves in the field. This difference may account for the discrepancy between the laboratory-determined growth rate and that ob-served in the field. Finally, some consideration is given to observational evidence and critical scales green to observational evidence and critical scales relating to the nonlinear mechanism for wave generation. Also, a nonlinear mehanism is specu-lated to furnish a key link for generation of sea waves-wind generating ripples (surface roughness) due to a sequence of actions of resonance, laminar and sheltering models, and a nonlinear mechanism transferring energy from ripples to dominant waves. (Sinha-OEIS) W74-04330

THERMAL DISTURBANCE DUE TO CHANNEL SHIFTING, MACKENZIE DELTA, N.W.T., CANADA, Carleton Univ., Ottawa (Ontario).

For primary bibliographic entry see Field 2C. W74-04351

EFFECTS OF PERMAFROST ON STREAM FLOW CHARACTERISTICS IN THE DISCONTINUOUS PERMAFROST ZONE OF CENTRAL

ALASKA, Dubois and King, Inc., Randolph, Vt. For primary bibliographic entry see Field 2C. W74-04392

THE NATURE OF THE SEAWATER-FRESH-WATER INTERFACE DURING BREAKUP IN THE COLVILLE RIVER DELTA, ALASKA, Louisiana State Univ., Baton Rouge. For primary bibliographic entry see Field 2C. W74-04397

HYBRIDIZATION BETWEEN THE DARTERS PERCINA CRASSA ROANOKA AND PERCINA PERCINA CHASSA ROANGEA, ETHEOSTO-MATINI), WITH COMMENTS ON THE DIS-TRIBUTION OF PERCINA CRASSA ROANOKA IN NEW RIVER,
Virginia Polytechnic Inst. and State Univ.,

Blacksburg, Dept. of Biology.
C. H. Hocutt, and P. S. Hambrick.
American Midland Naturalist, Vol 90, No 2, p 397-405, October 1973. 3 fig. 2 tab, 26 ref.

Descriptors: *Fish taxonomy, *Darters, *Virginia, Fish, Freshwater fish, Systematics, Classification, Aquatic habitats.
Identifiers: *New River(Va), Hybrids(Fish).

A new Percina hybrid, Percina crassa roanoka X Percina oxyrhyncha, is described from the upper Kanawha (New) River system in Virginia. Meristic characters of the hybrid are either intermediate or characters of the nybrid are either intermediate to-closer to P. c. roanoka; morphometrics indicate in-termediacy or similarity to P. oxyrhyncha. P. c. roanoka, originally described from the Roanoke River drainage, is introduced to the New River system and has characteristics of an opportunistic species. (Knapp-USGS)

W74-04472

THE ELEVATION, SLOPE, AND CURVATURE SPECTRA OF A WIND ROUGHENED SEA SUR-

FACE, New York Univ., Bronx. School of Engineering

New York Univ., Bronx. School of Engineering and Science.
W. J. Pierson, Jr., and R. A. Stacy.
Available from NTIS, Springfield, Va 22151
NASA CR-2247 Price \$4.50 printed copy (domestic) \$7.00 (foreign); \$1.45 microfiche. National Aeronautics and Space Administration Contractor Report CR-2247, December 1973. 126 p, 30 fig, 5 tab, 63 ref. NASA Contract NASI-10090.

Descriptors: *Waves(Water), *Winds, *Ocean waves, Frequency analysis, Turbulence. Identifiers: *Roughness(Sea-surface).

The elevation, slope and curvature spectra of a wind roughened sea surface were deduced from an analysis of a wide variety of reports and data sources and verified to a large extent by means of both these sources and other independent sources. The spectra are defined as a function of wave number and depend on the friction velocity. There are five wave number ranges of definition, called the gravity wave-gravity equilibrium range, the isotropic turbulence range, the connecting range due to Leykin and Rosenberg, the capillary range, and the viscous cutoff range. The higher wave number ranges are strongly wind speed dependent. and there is no equilibrium (or saturated) capillary range, at least for winds up to 30 meters/sec. Some range, at least for winus up to 30 meters/sec. Some properties of the angular variation of the spectra were also found. For high wave numbers, espe-cially in the capillary range, the results are shown to be consistent with the Rayleigh-Rice backscattering theory (Bragg scattering), and certain pro-perties of the angular variation are deduced from backscatter measurements. (Knapp-USGS) W74-04476

A LABORATORY INVESTIGATION OF FREE SURFACE FLOWS OVER WAVY BEDS,
Iowa Univ., Iowa City. Inst. of Hydraulic Research. For primary bibliographic entry see Field 8B. W74-04477

HYDRAULIC PERFORMANCE OF BRIDGES-EXCAVATIONS AT BRIDGES, Geological Survey, Jackson, Miss. For primary bibliographic entry see Field 8B. W74-04482

EFFECTS OF URBANIZATION ON FLOODS IN THE DALLAS, TEXAS, METROPOLITAN AREA, Geological Survey, Austin, Tex. For primary bibliographic entry see Field 4C. W74-04483

SPECIAL ANALYSIS OF SHORT INERTIAL-IN-TERNAL WAVE RECORDS,
Department of the Environment, Ottawa
(Ontario). Marine Sciences Directorate. C. J. Frankignoul, and R. F. Henry. Manuscript Report Series, No 34, 1973. 26 p. 6 fig.

Descriptors: *Waves(Water), *Time series analysis, Frequency analysis, Simulation analysis, Fourier analysis, Statistics, Statistical methods,

Various methods of trend removal in time series of ocean waves are compared, by means of experi-ments on both simulated and observed data, to establish which is the most effective in minimizing leakage between frequency bands during spectral analysis of short segments of a record with a dominant inertial frequency contribution. Removal of

Group 2E-Streamflow and Runoff

the linear trend defined by joining the end-points of each segment gives substantial improvement. (Knapp-USGS) W74-04489

SURFACE-WATER AVAILABILITY, LAU-DERDALE COUNTY, ALABAMA, Geological Survey, University, Ala. D. M. O'Rear, A. L. Knight, J. R. Harkins, and J.

D Willmon. Alabama Geological Survey Map 107, 1972. 11 p, 5

fig, 1 map, 1 tab, 16 ref.

Descriptors: Water resources, *Surface waters, *Streamflow, *Runoff, *Alabama, Water yield, Flow rates, Average flow, Low flow, Hydrologic data, Water temperature, Water quality, Chemical analysis, *Maps, Hydrographs, Flow duration, Low-flow frequency, Hydrologic budget. Identifiers: Lauderdale County(Ala).

The Tennessee River, the southern boundary of Lauderdale County, Alabama, has an average flow of 32,800 mgd and Elk River, the southeastern boundary, has an average flow of 2,470 mgd at its mouth. Other streams include Bluewater, Shoal, and Cypress Creeks in the central part of the county with average flows of 180,570, and 265 mgd, respectively, at their mouths; and Second Creek in the western part has an average flow of 90 mgd at its mouth. The statistical index used to describe low flows is the 7-day low flow (7-day Q2). The 7day Q2 is defined as the lowest average rate of flow for 7 consecutive days occurring at an average interval of 2 years. The Tennessee River has a 7-day Q2 greater than 1,000 mgd; however, the flow is subject to regulation by reservoirs. Elk River has a 7-day Q2 of 165 mg, and Shoal Creek has a 7-day Q2 of 114 mgd. Other streams in the county have 7-day Q2 values that range from 42 to less than 2 mgd. Surface-water data for Lauderdale County are presented in a manner that provides a visual appraisal of surface-water availability which can be compared with other counties in the State. An average-flow and low-flow map is included. Water from the Tennessee River and other streams in the county is of suitable chemical quality for most uses. The water temperature ranges from about 4C in January to 28C in August. (Woodard-USGS) W74-04494

SPRING RUNOFF FROM HILLSLOPES, SMALL WATERSHEDS, AND RIVER BASINS (VESENNIY STOK SO SKLONOV, MALYKH VODOSBOROV, RECHNYKH BASSEYNOV), Akademiya Nauk SSSR, Moscow. Geografii.

N. I. Koronkevich, and Z. A. Krylova. Vodnyye Resursy, No 3, p 93-108, 1973. 5 fig, 1

tab, 48 ref. Descriptors: *Overland flow, *Runoff, *Slopes,

*Small watersheds, *River basins, Land management, Spring, Maps. Identifiers: *USSR. Procedures are presented for determining over-

land flow from data of water-balance and runoff stations. Average long-term overland flow in forested steppe and steppe zones and in the southern part of the forested zone of the USSR is calculated on the basis of runoff from a forested area, a fall-plowed field, and from fields left unplowed since fall. Relations are established between overland flow and streamflow and between overland flow and runoff from small watersheds. The relations obtained can be used to prepare a small-scale map of overland flow in spring from fields in the Don River basin. (Josefson-USGS) W74-04577

WAVE ACTION AND BREAKWATER DESIGN, HAMLIN BEACH HARBOR, NEW YORK, Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab. For primary bibliographic entry see Field 8B. W74-04588

PALEOHYDROLOGY AND SEDIMENTOLOGY OF LAKE MISSOULA FLOODING IN EASTERN OF LAKE MISSOCIAL CONTROL OF LAKE MISSOCIAL WASHINGTON,
Tayon Univ., Austin. Dept. of Geological

Texas Univ.,

Geological Society of America Special Paper 144, 1973. 79 p, 55 fig, 1 plate, 2 tab, 94 ref, 2 append.

*Paleohydrology, Descriptors: "Faieonydrology, Schimentary structures, "Washington, Ripple marks, Sand bars, Sediment transport, "Pleistocene epoch, Columbia River, Stage-discharge raltions, Mon-

Identifiers: Missoula floods(Wash), Columbia Plateau(Wash), Lake Missoula(Mont).

The Missoula floods of late Pleistocene age probably involved the largest discharges of fresh-water that have been documented in the geologic record. The Columbia Plateau of eastern Washington contains evidence for flooding in pre-Bull Lake, Bull Lake, and early Pinedale time. The early Pinedale flood was the most extensive and left considerable high-water mark evidence in the form of (1) eroded channel margins, (2) highest flood gravel, (3) minor divide crossings, and (4) ice-rafted erratics. The water-surface gradients and channel geometry provide input data for the slope area and contracted-opening hydraulic cal-culation procedures. Maximum discharges through scabland channels ranged from 752 million cubic feet per second in the Rathdrum Prairie to 17.5 milcubic feet per second in Rocky Coulee. The flood's duration was amazingly short. Even with gradually waning flows, the early Pinedale flood probably lasted only a week or two. Sixty trains of giant current ripples are recognized in the study area. Mean ripple chords vary from 60 to 425 feet. Mean ripple heights vary from 1.5 to 22 feet. (Knapp-USGS) W74-04599

WAVES AT CAMP PENDLETON, CALIFOR-

California Univ., San Diego, La Jolla. Inst. of Geophysics and Planetary Physics. W. H. Powers, Jr., L. Draper, and P. M. Briggs. In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, Sep-tember 1968. American Society of Civil Engineers, Vol 1, Part 1, Chap 1, p 1-8, 1969. 5 fig. 7 ref.

Descriptors: *California, *Waves(Water), *Coasts, *Shallow water, Measurement, *Ocean waves, Seasonal. Identifiers: Camp Pendleton(CA), *Nearshore processes.

Waves were recorded for nine years at Camp Pendleton, California and the results of an analysis of records over two years are presented graphically. There appeared to be no consistent seasonal distribution of wave heights or periods, so the reults are presented on a yearly basis. The significant wave height exceeded two feet for 34 percent of the time. The calculated height of the highest wave of all during the nine years was 14.5 feet. It is inferred that the most probable value of the height of the highest wave in 50 years is likely to be about 19 feet. (Sinha-OEIS) W74-04607

SHALLOW WATER WAVES: A COMPARISON OF THEORIES AND EXPERIMENTS, Tetra Tech, Inc., Pasadena, Calif. B. Le Mehaute, D. Divoky, and A. Lin.

In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968. American Society of Civil Engineers, Vol 1, Part 1, Chap 7, p 86-107, 1969. 11 fig, 28 ref. DASA-01-67-C-0099.

Descriptors: *Shallow water, *Waves(Water). Identifiers: Velocity field, *Cnoidal wave theory, Solitary waves, Airy theory, Water depths.

A series of experiments were performed to determine the velocity field and other characteristics of large amplitude shallow water waves. The experimental results were compared with the predictions of a variety of wave theories including those commonly used in engineering practice. While no monny used in engineering practice. While in theory was found exceptionally accurate, the cnoidal wave theory of Keulegan and Patterson appears most adequate for the range of wavelengths and water depths studied. (Sinha-OEIS) W74-04609

BREAKING WAVE CRITERIA; A STUDY EM-PLOYING A NUMERICAL WAVE THEORY, Florida Univ., Gainesville. Dept. of Coastal and Oceanographic Engineering. R. G. Dean.

In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968. American Society of Civil Engineers, Vol 1, Part 1, Chap 8, p 108-123, 1969. 7 fig, 1 tab, 15 ref. DACW72-67-C-0009.

Descriptors: *Shallow water, *Waves(Water). Identifiers: *Numerical wave theory, Stream function, *Wave height, Water depth, Stability criteria, *Breaking waves.

For progressive waves, the kinematic stability parameter, rather than the dynamic parameter, overns breaking. The dynamic criterion was found to equal zero at breaking; this implies that immediately under the crest, hydrostatic conditions prevail. The enclosed crest angle associated with the limiting wave is approximately equal to 120 degrees, a value determined by previous investigators. Earlier investigators. Earlier investigators, however, required the a priori as-sumption that the crest form be an angle which is a submultiple of 360 degrees. The breaking wave heights determined here are somewhat higher (0 to 28 percent) than those usually referenced. The sucain function wave theory appears well suited for representing the geometry, kinematics, and dynamics of periodic water wave systems up to breaking conditions. (Sinha - OEIS) W74-04610 stream function wave theory appears well suited

HYPERBOLIC WAVES AND THEIR SHOAL-

ING, Kyoto Univ. (Japan). Dept. of Civil Engineering. . Iwagaki.

In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968. American Society of Civil Engineers, Vol 1, Part 1, Chap 9, p 124-144, 1969. 11 fig, 23

Descriptors: *Coasts, *Waves(Water), *Shallow water. Identifiers: *Hyperbolic waves, Wave theory, *Shoaling.

Formulae are proposed for various wave characteristics of waves referred to as 'hyperbolic waves'. This theory of the waves does not contain the Jacobian elliptic function but does use the primary function. A combination of the hyperbolic wave theory and the Stokes wave theory make it possible to give a qualitative description of finite amplitude wave characteristics in shallow water before the waves break. (Sinha - OEIS)

Streamflow and Runoff-Group 2E

EFFECT OF BEACH SLOPE AND SHOALING WAVE ASYMMETRY.

M. D. Adevemo. In: Proceedings of Eleventh Conference Coastal Engineering, London, England, September 1968, Americal Society of Civil Engineers. Vol 1, Part 1, Chap 10, p 145-172, 1969. 11 fig, 17

Descriptors: *Beaches, Slopes, *Shallow water, *Waves(Water), Coasts. Identifiers: *Shoaling, Identifiers: Wave asymmetry. *Breaker zone, *Oscillatory waves.

The geometrical asymmetry associated with shallow water oscillatory waves in the breaker zone is discussed. Three descriptions of wave asymmetry are defined and examined: Wave vertical asymare defined and examined: wave vertical asymmetry: and Wave horizontal asymmetry. The effects of shoaling, produced by beaches of different slope, on the wave asymmetry are examined. Six beach slopes in the range 1:4 to 1:18 were employed, and a quantitative correlation was found to exist between the wave slope asymmetry, wave horizontal asymmetry and the wave vertical asymwave metry. An expression is given for the wave horizontal asymmetry based on the expression for the wave vertical asymmetry from the cnoidal wave theory. The theoretical study of wave slope asymmetry made by Biesel and the results of the experimental work on the wave slope asymmetry in the present work were compared and gave a good agreement. (Sinha - OEIS) W74-04612

THE EFFECTS OF BOTTOM CONFIGURA-TION ON THE DEFORMATION, BREAKING AND RUN-UP OF SOLITARY WAVES, Oregon State Univ., Corvallis. Dept. of Civil En-

gineering. F. E. Camfield, and R. L. Street.

In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, Sep-tember 1968. American Society of Civil Engineers, Vol 1, Part 1, Chap 11, p 173-189, 1969. 11 fig, 11

Descriptors: *Waves(Water), Topography, Slopes, *Shallow water, Continental shelf, Slopes,

Identifiers: *Solitary waves, Run-up, *Shoaling, Breaking, *Bottom configuration, Long waves.

An initial set of experiments investigated the effect of the initial bottom slope on the breaking and run-up of a wave on a second, higher slope. A second set of experiments considered the effect of a continental shelf configuration on the transmissibility of waves in the shoreward direction, and the decomposition of the waves due to the shallower water depth on the continental shelf. It was found that, in order to make predictions at or near the shoreline for waves generated in deep water, it is necessary to consider the total configuration of the bottom leading to the shoreline. The results for a low initial slope followed by a second higher slope show that the initial slope has a significant effect on both the breaking height and the run-up of the waves. The experiments showed qualitative trends which could be used to predict the effects of vari-ous slope combinations. (Sinha - OEIS) W74-04613

WAVE REFLECTION AND TRANSMISSION IN CHANNELS OF VARIABLE SECTION, Rutgers - The State Univ., New Brunswick, N. J. Dept. of Civil Engineering. For primary bibliographic entry see Field 8B.

SPECTRA OF THE TEMPERATURE AND HU-MIDITY FLUCTUATIONS AND OF

FLUXES OF MOISTURE AND SENSIBLE HEAT IN THE MARINE BOUNDARY LAYER. Oregon State Univ., Corvallis. Dept. of Oceanog-

G. T. Phelps, and S. Pond.
Journal of the Atmospheric Sciences, Vol 28, p 918-928, September 1971. 1 tab, 8 fig, 9 ref.

Descriptors: *Temperature, *Humidity, *Fluctuations, *Turbulent boundary layers, *Theoretical analysis, Oceanography, Atmosphere, Moisture, Heat, Velocity, Air-water interfaces, Analytical techniques, Data collections, Data processing, Mathematical models, Statistics.

Data from the Barbados Oceanographic and Meteorological Experiment and from a pre-BOMEX cruise near San Diego are analyzed with emphasis on the similarities and differences between temperature and humidity and on their cospectra and correlations with the velocity fluccospectra and correlations with the velocity inde-tuations. Temperature and humidity fluctuations were very similar with only minor differences in data from both San Diego experiments and BOMEX. In the BOMEX the low frequency ends of the temperature spectra were much lower than in San Diego, and consequently, so are the low frequency ends of the temperature-vertical velocity cospectra. On the basis of these results and comparison with other studies it is concluded that the humidity spectra and humidity-vertical velocity cospectra have universal forms when normalized according to the Monin-Obukhov similarity theory. The temperature spectra cannot be in-terpreted in terms of similarity theory because this theory does not include the effects of radiative transfer. Temperature and humidity are not similar scalars and measurements for one are not necessarily indicative of the behavior of the other. (Jerome-Vanderbilt) W74-04672

MEASUREMENTS OF THE TURBULENT FLUXES OF MOMENTUM, MOISTURE AND SENSIBLE HEAT OVER THE OCEAN,

British Columbia Univ., Vancouver. Inst. of Oceanography

S. Pond, G. T. Phelps, J. E. Paquin, G. McBean, and R. W. Stewart.

Journal of Atmospheric Sciences, Vol 28, p 901-917, September 1971. 1 tab, 7 fig, 26 ref, 1 append.

Descriptors: *Measurement, *Turbulent boundary layers, *Fluctuations, *Moisture, *Heat, *Oceans, Oceanography, Atmosphere, Data collection, Data processing, Turbulence, Momentum equa-tion, Analytical techniques, Instrumentation, Aerosols, Velocity, Mathematical models, Model studies, Evaluation, Theoretical analysis, Wind velocity, Humidity, Evaporation.

Results are described of the fluxes of momentum. moisture, and sensible heat by both the eddy correlation and dissipation techniques. The data were collected on the R/V 'Flip' during the Barbados Oceanographic and Meteorological Experiment and during a pre-BOMEX cruise near San Diego. and during a pre-BOMEA cruise near San Diego.

The instrumentation, methods of determining flux and methods of data analysis are described. The spectra of the three components of velocity fluculations and the cospectra between vertical fluctuations and the downstream velocity, temperature and humidity fluctuations are presented. The fluxes determined by the eddy correlation are compared with those estimated from rates of dissipation, and these fluxes are then used to evaluate the constants in the bulk aerodynamic formulas. The normalized vertical downstream cospectra appear to have universal forms and are similar to earlier results. The normalized vertical tempera-ture cospectra do not appear to have a universal The dissipation and eddy correlation methods were found to agree well for momentum flux. The moisture flux shows a strong correlation with wind speed times the mean sea-air humidity difference. This result was based on direct measurements of the flux and agrees well with earlier estimates from evaporation pan data. (Jerome-Vanderbilt)

COMMENTS ON JOHNSON'S PAPER, 'ON THE WIND-DRIVEN CIRCULATION OF A STRATIFIED OCEAN', RAND Corp., Santa Monica, Calif.

R. C. Alexander.

Journal of Marine Research, Vol 31, No 1, p 87-89, 1973. 5 ref.

Descriptors: *Ocean circulation, *Wind, *Temperature, *Evaluation, Oceanography, Turnovers, Upwelling, Boundary layers, Model studies, Mathematical models, Theoretical analysis, Mixing

Johnson's (1971) (See W73-13429) assumptions of zero net transport of water from the interior into the eastern boundary region at every latitude and an exponential solution to the thermocline problem create discripancies in his predictions. Although his assumptions seem plausible, they are not obviously true because a net change in north south flow in the boundary region between some two latitudes might require net east-west flow from the interior at intervening latitudes. The assumption of a balance between transports in the upper and intermediate layers when applied to the intermediate solution leads to values of tempera-ture that increase too rapidly with decreasing latitude to agree with nature. Johnson's results concerning eastern-boundary region and upwelling are based on assumptions rather than analysis, and the observable quantity, temperature, does not agree with nature. More complete analysis of the astern-boundary region is necessary. (Jerome Vanderbilt) W74-04675

FIELD MEASUREMENTS OF SWELL OFF THE ISLAND OF ARUBA,
Johns Hopkins Univ., Baltimore, Md. Chesapeake

Bay Inst. W. S. Wilson.

W. S. WISON.
Available from NTIS as AD-694 443 for \$6.00 paper copy, \$1.45 microfiche. Technical Report No 56, prepared for the Office of Naval Research, Reference 69-9, August 1969. 64 p, 31 fig, 3 tab, 13 ref. Nonr 4010(11).

*Island, Descriptors: Coasts. Refraction(Waterwaves), *Waves(Water), *Storms, Wave propagation.
Identifiers: Trade Winds, *Venezuela(Aruba),
*Swell, Wave ray patterns, Caribbean Sea, Mona Passage.

Intermittently during the winter, swell and as-sociated breakers appear along a beach on the lee side of Aruba, an island off the coast of Venezuela in the Trade Winds. It has been suggested that 14to 15-sec waves, generated by winter storms off the mid-Atlantic coast of North America, the mid-Atlantic coast of North America, propagate southward to Mona Passage where they are refracted. They then propagate across the Caribbean Sea toward Aruba where they are refracted off the northwest tip of the island and arrive on the leeward coast. Measurements of swell off the broth bout bear conducted theirs. off the beach have been conducted during March 1969. The instrumentation, field procedure, and computational methods are described. Spectra, directions of travel for the swell, and probable generation areas are presented. Reasonable agreement is found between measured swell directions and directions deduced from wave-ray patterns. All evidence obtained is consistent with the hypothesis of a North Atlantic generation area. (Sinha-OEIS) W74-04723

WAVE FORECASTING RELATIONSHIPS FOR THE GULF OF MEXICO, Corps of Engineers, Washington, D.C. Beach Ero-

Group 2E-Streamflow and Runoff

C. I. Bretschneider. Technical Memorandum No 84, December 1956. 27 p, 16 fig, 1 tab, 21 ref, append.

Descriptors: *Forecasting, *Waves(Water), Numerical analysis, Slopes, Winds, Statistics, Topography, Coasts, *Gulf of Mexico. Identifiers: *Bottom friction, Wind generated waves, *Hindcasting, *Wind waves, Averaging techniques

The development and application of a method for computing wind wave data over the Continental Shelf along the United States coast of the Gulf of Mexico is described. A set of generalized forecast-ing curves is required for each location and each direction to bring the waves in over the shallow sloping bottom to the desired depth. Using deep-water forecasting relationships and taking bottom friction into account, a generalized set of dimen-sionless forecasting relationships is prepared for each of five locations for which statistical deepwater wave data are compiled. The forecasting curves are intended for the most frequent minimum fetch and corresponding wind speed for various deep-water wave height ranges and average bottom conditions of various directions. For the cases of winds parallel to the coast or from land to sea the curves are applicable to all water depths. However, for the case of winds blowing from sea toward land, the forecasting relationships are satisfactory only for depths of about 20 feet or greater, although the technique has been stretched to a depth of 12 feet for cases where winds are not too high. At depths of about 20 feet or less the bottoo nigh. At depins of about 20 feet or less the bottom slope changes too rapidly for the theory to apply, and longer period swell will be breaking in the surf zone, thereby obscuring the wind wave pattern. (Sinha-OEIS) W74-04729

CHARACTERISTICS OF STREAMFLOW AT GAGING STATIONS IN THE LOUP RIVER BASIN, NEBRASKA,

Geological Survey, Lincoln, Nebr.

F. B. Shaffer.

Open-file Report 7401, January 1974, 105 p. 16 fig.

Descriptors: *Streamflow, *Nebraska, Statistics, Discharge(Water), Hydrographs, Data collections, *Hydrologic data, Diversion, Withdrawal. Identifiers: *Loup River(Nebr).

Statistics are presented on the flow of streams in the Loup River basin, Nebraska. As major irriga-tion projects have been constructed in the basin since gaging of streamflow was begun, the complete record of water discharge at some gaging complete record of water discharge at some gaging stations includes periods before and after stream-flow was first affected by diversions to an up-stream project. Streamflow statistics and ex-ceedence probability graphs of daily discharge are presented for nine sites on the Middle Loup River and its tributaries, seven on the North Loup and its tributaries, and seven on the Loup River and its tributaries below the confluence of the North and Middle Loup Rivers. Also presented are ex-ceedence probability graphs for six canals divert-ing from the Middle Loup River and for three canals diverting from the North Loup River. (Knapp-USGS) W74-04794

SURFACE- AND GROUND-WATER CONDI-TIONS DURING 1959-61 IN A PART OF FLETT CREEK BASIN, TACOMA, WASHINGTON,

Geological Survey, Tacoma, Wash. F. M. Veatch, G. E. Kimmel, and E. A. Johnston. Open-file report, 1966. 42 p, 20 fig, 7 tab.

Descriptors: *Surface-groundwater relationships, data, *Alluvial Discharge(Water), *Hydrologic channels, Streamflow, *Washington, Hydrogeology. Identifiers: Tacoma(Wash).

The Flett Creek area near Tacoma, Washington, was studied to define its groundwater and surface-water characteristics. The study is intended to provide a basis for comparisons and analyses of changes in water regimen that may develop as a result of man's activities, including construction result of man's activities, including construction of storm sewers and landfill, and expansions in population, industry, and water use. Much of the Flett Creek channel lies on thick beds of peat; these, in turn, are underlain by permeable glacial deposits. The groundwater and surface water are in hydraulic continuity except in one short reach. In some reaches the creek alternately gains and loses flow depending on the position and slope of the adjacent water table. The flow of Flett Creek the adjacent water table. The flow of Flett Creek ranged from 1.2 to 40 cfs during the period May 1959 to December 1961. The chemical quality of the surface runoff and the water from wells is roughly the same, although minor seasonal variations between them occur. Water from both sources is generally soft and low in mineral context. The executivation of a new denser shaped for tent. The construction of a new deeper channel for the creek, for passing increased flood inflow from storm sewers, would have the ultimate effect of depressing the water table adjacent to the creek by an amount approximating the depth of excavation. The peat would present problems in channel construction, and would seriously affect the structural stability of an enlarged channel. (Knapp-USGS) W74-04796

THE FALLACY OF BAER'S LAW OR CORIOLIS' EFFECT ON THE MEANDERING Karachi Univ (Pakistan)

For primary bibliographic entry see Field 8B. W74-04799

POWER LAW DEPENDENCE ON TIME OF FOWER LAW DEFENDENCE ON TIME OF RIVER FLOOD DECAY AND ITS RELATION SHIP TO LONG-TERM DISCHARG FREQUENCY DISTRIBUTION,

California Univ., Los Angeles. Dept. of Planetary For primary bibliographic entry see Field 4A. W74-04806 and Space Science.

HYDROLOGIC DATA FOR SMALL RURAL CATCHMENTS IN AUSTRALIA, 1973, Snowy Mountains Engineering Corp., Cooma (Australia).

Australian Water Resources Council Technical Paper No 6 (Research Project No 68/1), 1973. 146 p, 1 fig, 2 tab, 9 ref, 14 append.

Descriptors: *Data collections, *Small watersheds, *Australia, *Hydrologic data, Runoff, Floods, Flood control, Data storage and retrieval, Data processing.

The Australian Water Resources Council's Research Project 68/1 on the hydrology of small rural catchments involved the review, compila-tion, processing and analysis of data from small rural catchments (less than 10 sq mile). The ultimate aim was improving techniques for estimating yields and floods from these catchments. A large volume of streamflow and rainfall data were processed and stored on magnetic tape. Soils data and topographic data were also compiled and preliminary analysis of the data carried out. The report contains detailed lists of all the data which were processed, a summary of the analyses that were carried out, and recommendations for future activities. (Knapp-USGS) W74-04842

2F. Groundwater

STUDIES ON THE VALIDITY OF DARCY'S LAW FOR FLOW IN NATURAL SANDS, Georgia Univ., Athens. Dept. of Geology.

Available from National Technical Information Service as PB-228 022 \$3.75 in paper copy, \$1.45 in microfiche. Georgia Institute of Technology Enerrormental Resources Center, Atlanta Report, ERC-1573, November 1973, 44 p, 7 fig. 30 ref, 2 append. OWRR A-037-GA(1). 14-31-0001-3810.

Descriptors: *Darcy's Law *Permeability Tr anflow, Non-newtonian flow, *Subsurface flow, Porous media, Permeameters, Wells, *Sands. Identifiers: *Well entrance losses

Well entrance losses are commonly assumed to be due, in part, to non-Darcy flow near the well, but concrete evidence for non-Darcy flow of water in natural sands at any reasonably large macroscopic natural sands at any reasonably large macroscopic flow velocity does not appear to exist. On the other hand, at very low flow velocities, the permeability of sands varies with macroscopic flow velocity in a very complex way, and some earlier studies purporting to support the validity of Darcy's Law at very low flow velocities actually support this view. With increasing flow velocity, beginning with velocities below 0.005 cm/sec, permeability increases variety in the alpha interpermeability increases rapidly in the alpha inter-granular flow regime, decreases rapidly through the beta flow regime, increases relatively slowly with increasing velocity in the gamma flow regime, then remains nearly constant or decreases in the delta flow regime. The changes in flow resistance appear to be related, in part, to the surface chemistry of quartz. Experiments at high flow velocities showed no dramatic change in permeability in the range of 1 to 2 cm/sec., but, because of problems with piezometry, the results are not considered conclusive. One basic cause of 'well entrance losses' probably is over estimation of the average permeability of the aquifer, either because gas permeameters are used, or because tests with water are conducted in the first three flow regimes.

THE RESPONSE TO TIDAL FLUCTUATIONS OF A LEAKY AQUIFER SYSTEM, Hawaii Univ., Honolulu. Water Resources

Research Center.

J. A. Williams, and T. C. Liu.

Available from National Technical Information Service as PB-227 847 \$5.25 in paper copy, \$1.45 in microfiche. Technical Report No 66, July 1973. 41 p, 9 fig, 7 ref, append. OWRR A-020-HI(2). 14-31-0001-3211.

Descriptors: *Aquifers, *Tides, Groundwater, *Base flow, *Mathematical models, Computer programs, Tidal waters, Model studies. Identifiers: *Leaky aquifers, Response tides, Wave propagation.

A system of two isotropic and homogeneous in-finite aquifers, which are separated by an aquitard and subject to tidal fluctuations along their coastal boundary, has been analyzed and a mathematical model has been developed for the response of this model has been developed for the response of this system to tidal changes. The mathematical model consists of equations for the amplitude and phase of the response of both aquifers to a periodic tide. A computer program using the IBM 360 has been written for the evaluation of these equations. Both the mathematical model and the program have been verified by an electric analog model constructed for that purpose. The mathematical model was evaluated for an aquifer system where both aquifers have the same transmissability (and thereaquifers nave the same transmissaounty and uncer-fore the same leakage factor) but where the storage of the upper aquifer was 100 times that of the lower aquifer. Tidal periods of 0.5, 1, and 14 days were used. The results indicate that deviations from a response corresponding to the no-leakage case could be from 50 to 100 percent or rearrange case could be find 30 to be percent of either aquifer. Also, such deviations were produced by a relatively moderate amount of leakage, i.e., 1/B sq > or = to 0.154/10,000 sq ft. W74-04308 GROUNDWATER INVESTIGATIONS IN PER-MAFROST REGIONS OF NORTH AMERICA: A

REVIEW, Geological Survey, Boston, Mass. J. R. Williams, and R. O. van Everdingen. In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 435-446, 1973. 73 ref.

Descriptors: *Permafrost, *Groundwater, *Arctic, *Reviews, Surface-groundwater relationships, Groundwater basins, Saline water-freshwater interfaces, Hydrogeology.

Typical recent and current studies dealing with water balance of small basins, saline water-fresh-water interface in arctic deltas, location of water supplies in arctic regions, and occurrence of artepressures and their effects on wells and pipelines in permafrost areas are reviewed. A natural consequence of the basin hydrology approach is the current application of mathema and conceptual models to simulate the operation of the hydrologic cycle. Lack of data on infiltra-tion rates, soil moisture, distribution of permafrost, and on hydraulic conductivity of the subsurface materials has prevented assessment of the groundwater component in the basins studied. Groundwater studies are part of the evaluation of the impact of proposed developments on the en-vironment. In these studies, less emphasis is placed on groundwater supply and more on the role of groundwater and frost-heaving pressures developed during the freeze-thaw cycle and their effect on slope and riverbed stability and on the nature and extent of icings. Increased exploration for oil and gas in the North American Arctic has yielded extensive information on groundwater flow systems and quality of water in bedrock aquifers. (See also W74-04346) (Knapp-USGS)

GROUNDWATER PORE PRESSURES ADJACENT TO SUBARCTIC STREAMS,

Alaska Univ., College. For primary bibliographic entry see Field 2C. W74-04393

RECHARGE OF A CENTRAL ALASKA LAKE BY SUBPERMAFROST GROUNDWATER.

Alaska Univ., College. D. L. Kane, and C. W. Slaughter. In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 458-462, 1973. 3 fig, 11

Descriptors: *Permafrost, *Lakes, *Surface-groundwater relationships, Discharge(Water), Hydrogeology, Temperature, Groundwater movement.

The existence of an unfrozen zone beneath a lake surrounded by permafrost and recharge of the lake from subpermafrost aquifers through the thawed zone were shown both by piezometer and tem-perature data. In the zone of discontinuous permafrost, including the lowlands of central Ala it is likely that many lakes indicate hydrologic con-nections between subpermafrost aquifers and the surface. While the bog lake studied is a point of discharge for groundwater, other small lakes might be either recharge or discharge points for subper-mafrost aquifers. (See also W74-04346) (Knapp-USGS) W74-04394

RISK OF UNCONTROLLED FLOW FROM WELLS THROUGH PERMAFROST,
Cold Regions Research and Engineering Lab.,

K. A. Linell.

In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 462-468, 1973. 6 fig, 2 tab,

Descriptors: *Water wells, *Permafrost, Wells, Frozen ground, Artesian wells, Well casings, Water temperature, Freezing, Thawing, Subsidence, *Alaska.

Where groundwater below permafrost is under ar-tesian pressure, risk exists that piping, erosion, uncontrolled flow, settlement of wellhead facili-ties, and damage to the well casing may occur ties, and damage to the well casing may occur when a water well, oil well, or subsurface explora-tion boring is drilled through the permafrost. Possible consequences attending uncontrolled flow include formation of a constantly enlarging thaw and erosion pit at the well, permafrost degradation and terrain damage in the area ex-posed to surface and subsurface discharge from the well, ice fog and ground icing in development of frost mounds, and waste of expensively developed water. Reestablishment of con-trol may be difficult and expensive. Reliable, effective resistance to piping, erosion, and blowout under artesian pressure and flow conditions of significant magnitude in a well drilled through permafrost requires proper initial installation of the well casing, based on accurate knowledge and evaluation of the permafrost conditions. If the per-mafrost is thaw-stable, without excess ice, the cas-ing should be tightly installed through the full pering should be tightly installed through the full per-mafrost zone, except that in thaw-stable bedrock casing is not needed unless for other reasons than thaw instability. If the permafrost is high-ice-con-tent, thaw-unstable soil or rock, not only must the casing be tightly installed in the permafrost but the maintenance of a permanently frozen contact and seal between the casing and the permafrost may also be necessary. (See also W74-04346) (Knapp-USGS) W74-04395

A GROUNDWATER SUPPLY FOR AN OIL CAMP NEAR PRUDHOE BAY, ARCTIC ALASKA, Metcalf and Eddy, Inc., Boston, Mass. P. G. Sharmon.

R. G. Sherman. In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 469-472, 1973. 2 fig, 12

Descriptors: *Groundwater, *Permafrost, *Arctic, *Alluvial channels, Alluvium, Frozen ground, Water supply, *Alaska, Ice, Water quality, Pota-Identifiers: *Sagavanirktok River(Alaska).

In designing an oil camp on the west bank of the Sagavanirktok River 11 km south of Prudhoe Bay, the first step was to locate a year-round supply of potable water. Permafrost thickness of as much as potable water. Permafrost thickness of as much as 610 m in the campsite area eliminated consideration of deep aquifers. Potential sources in lakes and in the nearby Sagavanirktok River and in aquifers beneath the lakes and the river were explored. A year-round supply of good quality water exists in an alluvial aquifer beneath the Sagavanirktok River. At sites near the coastline, the aquifer may be subject to saltwater encroachment, induced either by heavy pumping during periods of zero river flow or by natural upduring periods of zero river flow or by natural upstream migration of the saltwater as flushing ac-tion of the freshwater underflow supported by streamflow ceases. (See also W74-04346) (Knapp-USGS) W74-04396

PREDICTION OF THE 1972 MANAGUA REDICTION OF THE 1972 MANAGUA, NICARAGUA, EARTHQUAKE FROM GROUNDWATER CHANGES, INFERRED PROBABILITY OF EARTHQUAKES IN THE CITY OF MANAGUA, NICARAGUA, DURING THE SUMMER OF 1973, Santos and Heilemann, Managua (Nicaragua).

C Santos

Available from NTIS, Springfield, Va 22151, AD-762 134 Price \$3.00 printed copy; \$1.45 microfiche. Army Engineer Waterways Experiment Station Translation No 73-7, May 1973. 19 p, 3 fig, 5 tab, 8 Descriptors: *Earthquakes, *Recharge, *Water levels, *Groundwater, Faults(Geologic), Geophysics, Droughts, Rainfall, Infiltration. Identifiers: *Nicaragua(Managua).

Earthquakes in Managua, Nicaragua, are relatable to drought years and restrictions to replenishment of the Managua aquifer. Changes in water loading induce stresses which are relieved by fault movement and corresponding earthquakes. The December 1972 Managua earthquake was predicted before the event. These significant observations should be supplemented by other measure-ments such as geodetic strain, tilt, gravimetric anomalies, etc. There is a need to investigate hydrologic cycles in relation to tectonic activity in many earthquake-prone areas. (Knapp-USGS) W74-04467

HYDROGEOLOGIC CHARACTERISTICS OF THE SURFICIAL AQUIFER IN NORTHWEST HILLSBOROUGH COUNTY, FLORIDA, Geological Survey, Tallahassee, Fla. W. C. Sinclair.

Open-file report 73023, 1973. 97 p, 4 tab, 10 ref.

Descriptors: *Hydrogeology, *Aquifer characteristics, *Florida, *Groundwater movement, Leakage, Recharge, Permeability. Identifiers: Floridan aquifer, Hillsborough Coun-

Lithologic and gamma logs of 59 test holes in Hill-sborough County, Florida, were used in conjunction with laboratory analyses of samples to define the hydrogeology of the unconsolidated deposits of the surficial aquifer overlying the limestone Floridan aquifer. The surficial aquifer comprises an upper fine sand unit which averages about 15 feet thick and a lower sequence of sandy clay and clayey sand layers which average about 25 feet thick. Median grain size, specific yield, and verti-cal permeability of the surficial aquifer decrease downward. The coefficient of vertical permeability of the sand is about 100 gallons per day per square foot, but the coefficient of vertical permeability of the lower sand and clayey sand is much lower ranging from 0.01 to 0.1 gallon per day per square foot. A confining layer of dense clay underlies the surficial aquifer separating it from the Floridan aquifer below. The potentiometric surface in the surficial aquifer stands an average of 10 feet above that in the Floridan. Leakage from the surficial aquifer to the Floridan occurs through the confining layer as well as through perforations in comming layer as well as through perforations in the confining layer. A regional estimate of leakage, based on the average coefficient of vertical permeability, is about 140,000 gpd per square mile. (Knapp-USGS) W74-04468

EVALUATION OF THE GROUND-WATER SUPPLY AT EIGHT SITES IN GLACIER NATIONAL PARK, NORTHWESTERN MONTANA, Geological Survey, Helena, Mont. A. J. Boettcher.

Open-file report, 1974, 30 p. 17 fig. 2 tab. 2 ref.

Descriptors: *Groundwater, *National parks, "Montana, Hydrogeology, Water resources development, "Water supply, Water yield, "Water quality, Calcium, Bicarbonates. Identifiers: Glacier National Park(Mont).

Seven of eight test holes drilled in Glacier National Park derive water from the Quaternary alluvial or glacial deposits. The eighth test hole was dry. Aquifer tests indicated that production wells at the seven sites will yield enough water for domestic or campground uses. Estimated maximum pumping rates range from 4 to 50 gallons per minute. water is of excellent chemical quality and the major dissolved constituents are calcium and bicarbonate. (Knapp-USGS) W74-04469

Group 2F-Groundwater

GROUND WATER AND THE GEOTHERMAL

RESOURCE. Geraghty and Miller, Port Washington, N.Y. For primary bibliographic entry see Field 4B. W74-04586

MISSISSIPPIAN AQUIFER OF IOWA, Geological Survey, Iowa City, Iowa. For primary bibliographic entry see Field 7C. W74-04843

2G. Water In Soils

PERMAFROST: NORTH AMERICAN CONTRIBUTION TO SECOND INTERNATIONAL CONFERENCE.

For primary bibliographic entry see Field 2C. W74-04346

INFLUENCE OF CLIMATIC AND TERRAIN FACTORS ON GROUND TEMPERATURES AT THREE LOCATIONS IN THE PERMAFROST REGION OF CANADA,

National Research Council of Canada, Ottawa

For primary bibliographic entry see Field 2C. W74-04348

GEOPHYSICAL IDENTIFICATION FROZEN AND UNFROZEN GROUND, ANTARCTICA,

Northern Illinois Univ., De Kalb. For primary bibliographic entry see Field 2C.

PERMAFROST AND SNOWCOVER RELA-TIONSHIPS NEAR SCHEFFERVILLE,
McGill Univ., Schefferville (Quebec), McGill Sub-Arctic Research Lab.

For primary bibliographic entry see Field 2C.

GROWTH OF PATTERNED GROUND IN VIC-TORIA LAND, ANTARCTICA, Connecticut Univ., Storrs.

For primary bibliographic entry see Field 2C. W74-04367

A SIMULATION SENSITIVITY ANALYSIS OF THE NEEDLE ICE GROWTH ENVIRONMENT, Michigan Univ., Ann Arbor. For primary bibliographic entry see Field 2C.

W74-04370

SOIL DEVELOPMENT AND PATTERNED GROUND EVOLUTION IN BEACON VALLEY

ANTARCTICA, Washington Univ., Seattle. F. C. Ugolini, J. G. Bockheim, and D. M.

Anderson. In: International Conference on Permafrost, Yakutsk, USSR, 1973. p 246-254, 1973. 7 fig, 2 tab,

*Soil Descriptors: formation. *Antarctic. Permafrost, Soils, Freezing, Thawing, Frozen ground, Frozen soils, Frost, Frost action, Mass wasting, Solifluction.

Identifiers: Polygonal ground, Patterned ground, *Antarctica(Beacon Valley).

Soil formation in Antarctica is restricted not only by the limited extent of ice-free areas but also by the continuous low temperatures and the paucity of liquid water. Soils of continental Antarctica are of the desert type; they are devoid of an organic surficial layer, display coarse textures, are extremely dry, pulverulent, and show poor horizon distinction with minor textural and structural changes and little color differentiation. Two major soil units are distinguished in the northeast half of Beacon Valley, Antarctica. These two mappable units are related to the age of the glacial deposits units are related to the age of the glacial deposits and to the surficial expressions of nonsorted polygons. The soils of the well-developed polygons appear immature in contrast to the more mature conditions found in the poorly expressed polygons. The soils of the poorly expressed polygons have a fine texture, are more structured, are more oxidized, contain more salts, and have a greater thickness above the ice-cemented per mafrost than the soils of the well-developed polygons. The soils of the centers are more developed than the soils of the troughs. The growth of the sand wedges is greatly affected by the degree of soil development in the troughs. Once the soils in the troughs have acquired a com-pound structure enhanced by the presence of salts and clays, they are not able to flow and, therefore, to fill the contraction cracks. This lack of uniformity in growth rate may account for the observed discrepancy between the age of the wedges and the degree of soil development. (See also W74-04346) (Knapp-USGS) W74-04372

PHYSICS, CHEMISTRY, AND MECHANICS OF

FROZEN GROUND: A REVIEW,
Cold Regions Research and Engineering Lab.,
Hanover, N.H. For primary bibliographic entry see Field 2C. W74-04373

THE UNFROZEN WATER AND THE APPARENT SPECIFIC HEAT CAPACITY OF FROZEN SOILS,
Cold Regions Research and Engineering Lab.,

Hanover, N.H. For primary bibliographic entry see Field 2C. W74-04374

EFFECT OF POROSITY ON AMOUNT OF SOIL WATER TRANSFERRED IN A FREEZING SILT,

Rutgers - The State Univ., New Brunswick, N.J. For primary bibliographic entry see Field 2C. W74-04376

EVALUATION OF IN SITU CREEP PROPERTIES OF FROZEN SOILS WITH THE PRES-

Ecole Polytechnique, Montreal (Quebec) For primary bibliographic entry see Field 2C.

SHOCK-WAVE STUDIES OF ICE AND TWO FROZEN SOILS, California Univ., Livermore.

For primary bibliographic entry see Field 2C.

ENCOUNTERING MASSIVE GROUND ICE DURING ROAD CONSTRUCTION IN CENTRAL

ALASKA,
Cold Regions Research and Engineering Lab., For primary bibliographic entry see Field 4C. W74-04420

EFFECTS OF GROUND-ICE VARIABILITY AND RESULTING THAW SETTLEMENTS ON BURIED WARM-OIL PIPELINES,

Mackenzie Valley Pipeline Research Ltd., Calgary (Alberta).

For primary bibliographic entry see Field 4C. W74-04422

ONE-DIMENSIONAL MODEL OF THE MOVE-MENT OF TRACE RADIOACTIVE SOLUTE

THROUGH SOIL COLUMNS: THE PERCOL

MODEL,
Battelle-Pacific Northwest Labs.. Richland, Wash.

For primary bibliographic entry see Field 5B. W74-04444

RADIOLOGICAL STATUS OF THE GROUND-WATER BENEATH THE HANFORD PROJECT, JULY-DECEMBER 1972, Battelle Pacific Northwest Labs., Richland, Wash,

For primary bibliographic entry see Field 5B. W74-04452

STRONTIUM-90 AND CESIUM-137 LEVELS IN SOILS OF VARIOUS TYPES AT NIIGATA PRE-FECTURE, JAPAN,

Niigata Univ. (Japan). Faculty of Agriculture. For primary bibliographic entry see Field 5B. W74-04453

A RADIOLOGICAL ENVIRONMENTAL SUR-VEY AT EBR-II.

For primary bibliographic entry see Field 5B. W74-04455

PHOSPHORUS RELATIONSHIPS IN RUNOFF FROM FERTILIZED SOILS,

Agricultural Research Service, Lafayette, Ind. For primary bibliographic entry see Field 5B. W74-04471

LAND DISPOSAL OF WASTE GASES: 1. FLOW ANALYSIS OF GAS INJECTION SYSTEMS,

Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.

For primary bibliographic entry see Field 5E. W74-04479

LAND DISPOSAL OF WASTE GASES: II. GAS FLOW FROM BURIED PIPES, Arizona Univ., Tucson. Dept. of Soils, Water and

Engineering. For primary bibliographic entry see Field 5E. W74-04480

ON SOLVING THE UNSATURATED FLOW EQUATION: 2. CRITIQUE OF PARLANGE'S METHOD.

Australian National Univ., Canberra. Research School of Physical Sciences.

J. H. Knight, and J. R. Philip. Soil Science, Vol 116, No 6, 407-416, December 1973. 4 fig, 2 tab, 12 ref.

Descriptors: *Unsaturated flow, *Equations, Mathematical studies, Numerical analysis, Soil water movement, Sorption. Identifiers: *Parlange's method.

The physical content of Parlange's method of solving the flow equation is explored. His first approximation satisfies continuity in the integral but the second and higher approximations do not. Approximations beyond the first lack of any con-Approximations beyond the first tack of any con-straining link between the separate steps of 'satisfying continuity' and 'satisfying Darcy's law', which make up each interation. There is, consequently, nothing in the procedure to ensure convergence. A detailed investigation establishes the nonconvergence of the method when applied to one-dimensional sorption. The first approximation is best, and the higher approximations make oscillations of increasing magnitude about the exact solution. Two illustrative examples are given. The utility of Parlange's method is thus simply the utility of the first approximation: the dependence of this on the shape of the diffusivity function and on the flux-concentration relation is discussed. The method cannot be applied to two-and three-dimensional systems other than radially

symmetrical ones. (See also W74-02464) (Knapp-USGS) W74-04492

MEASUREMENT OF MOISTURE DIFFUSIVITY OF WET SWELLING SYSTEMS, Commonwealth Scientific and Industrial Research

Organization, Canberra (Australia). Div. of Environmental Mechanics.
D. E. Smiles, and A. G. Harvey.
Soil Science, Vol 16, No 6, p 391-399, December

1973. 6 fig, 8 ref.

Descriptors: *Soil water movement, *Expansive soils, *Diffusivity, Saturated flow, Diffusion, soils, *D Sorption.

A method for estimating the diffusivity function of a saturated swelling system is based on an equa-tion linking the sorptivity, the diffusivity function, and the flux concentration, and uses appropriate values of the flux-concentration relation to set limits of the diffusivity function. For the material used in the experiments demonstrating the procedure, the calculation errors were no more than 7.5 percent. (Knapp-USGS) W74-04493

ASPECTS OF COLOUR REMOVAL FROM PULP AND PAPER MILL EFFLUENTS, Central Public Health Engineering Research Inst.,

Nagpur (India) For primary bibliographic entry see Field 5D. W74-04514

INFLUENCES OF SOIL DENSITY, CLAY SILT AND HUMUS CONTENT ON MEASUREMENTS OF SOIL WATER BY NEUTRON GAUGES, (IN

GERMAN), Technische Universitaet, Munich (West Germany). Institut fuer Pflanzenbau und Pflanzen-

zuechtung. H. Hanus, A. Suess, and G. Schurmann Z Pflanzenernaehr Bodenkd. Vol 132. No 1. p 4-

Identifiers: *Clay, *Humus, Measurements, Neutron gauges, *Silt, *Soil water, *Soil density, Organic matter.

Multiple regressions were used to establish calibration curves, whereby the measured pulse rate, the humus-, clay- and silt content, dry density of the soil and moist density were considered. Dry density was a main factor for determining the absolute water content in a soil when using a neutron gauge. There was no effect of the humus content, probably because of a lower density in soil with a high content of organic matter. It was soil with a night content of organic matter. It was assumed that with an increasing clay content the number of neutron absorbing ions also rose. The results of neutron gauge measurements showed after a correction for dry density an accuracy equivalent to 3-4 gravimetric readings with soil sample cores of 100 cm3. In cases where higher accuracy is required, soil factors other than dry den-sity and clay and silt content should be considered. The necessary corrections for dry density and clay and silt content are shown in equations.—Copyright 1973, Biological Abstracts, Inc. W74-04556

SOIL CRUSTING RELATED TO SPRINKLER INTENSITY

Auburn Univ., Ala. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 3F. W74-04560

A SIMULATION MODEL FOR EVALUATING IRRIGATION MANAGEMENT PRACTICES, Minnesota Univ., St. Paul. Dept. of Agricultural For primary bibliographic entry see Field 3F. W74-04564

DETERMINATION OF SOIL MOISTURE BY REMOTE SENSING TECHNIQUES
(OPREDELENIYE VLAZHNOSTI POCHVY
DISTANTSIONNYMI AEROKOSMICHESKIMI

DISTANTONAMI), METODAMI), Akademiya Nauk SSSR, Moscow. Institut Geografii.
B. V. Vinogradov.

Vodnyye Resursy, No 3, p 70-92, 1973. 18 fig, 54

Descriptors: *Soil moisture, *Measurement, *Remote sensing, *Satellites(Artificial), Spectroscopy, Photography, Surveys, Terrain analysis, Infrared radiation. Identifiers: USSR

Remote sensing methods of soil moisture determination were investigated in three principal regions of the spectrum: the visible region (wavelengths 0.4 to 0.7 microns); the infrared region (wavelengths 0.7 to 15.0 microns); and the microwave region (wavelengths 0.8 to 10.0 cm). Remote sensing techniques are examined in ground experiments and in simulation studies based on data from aircraft and spacecraft. Soyuz-9 reflection spectra, Gemini-4 photography, and Nimbus-1 images are analyzed in the visible region of the spectrum. Nimbus-3 and Apollo-9 dayti images in the near-infrared region and Cosmos-226 daytime and nighttime images in the far-infrared region are analyzed in the infrared region of the spectrum. Emitted radiation data obtained from Cosmos-243 are analyzed in the microwave region of the spectrum. A multispectral and multiscale system of repetitive surveys at wavelengths ranging from 0.5 to 12.0 microns and from 0.8 to 9.0 cm or more and including control information from ground and aircraft is recommended. (Josefson-USGS) W74-04576

N ANALYTICAL STUDY OF A COILED-PIPE

HEAT SINK, Cold Regions Research and Engineering Lab., For primary bibliographic entry see Field 8B. W74-04589

QUICKCLAYS AS PRODUCTS OF GLACIAL ACTION: A NEW APPROACH TO THEIR NA-TURE, GEOLOGY, DISTRIBUTION GEOTECHNICAL PROPERTIES, eeds Univ. (England). Dept. of Civil Engineering.

L. G. Cabrera, and I. J. Smalley. Engineering Geology, Vol 7, No 2, p 115-133, October 1973. 4 fig, 2 tab, 54 ref.

Descriptors: *Quick clays, *Glacial drift, Soil mechanics, *Clays, Clay minerals.

Quickclays are products of glaciation, which acing provides the fine silt and clay sizes required to constitute quickelays. Two major factors account for the geotechnical properties. A composition factor is related to material comprising the soil system and a leaching factor is related to the clay-mineral content of the soil. Soils can be divided into three types, based on criteria of particle size and type of interparticle bond. The three main soil types have: (a) small particles and long-range forces--the bond/weight ratio R is high; (b) small particles and short-range forces--R>1; and (c) large particles and short-range forces--R<1. The most important property is a preponderance of in-active bonds in the soil system. This is achieved by a high content of nonclay mineral particles, and also may be assisted by leaching and cementation. If more than a critical proportion of long-range bonds are present, the required very high sensitivity does not occur. The initial failure of the soil may be treated as tensile using a volume failure criterion; the low settling velocity of the very small particles allows the solid-liquid transformation to occur after a modest shock loading. Observations of low thixotropy, lack of secondary set-tlement and sudden failure in compression tests can be explained by requirements of particle size and material. (Knapp-USGS)

A NUMERICAL CLASSIFICATION OF SELECTED LANDSLIDES OF THE DEBRIS SLIDE-AVALANCHE-FLOW TYPE, Macquarie Univ., North Ryde (Australia). School

of Earth Sciences

For primary bibliographic entry see Field 2J.

STRIATED GROUND, A TYPE OF PATTERNED GROUND IN THE PERIGLACIAL AREA OF THE VENEZUELAN ANDES, (IN SPANISH), Instituto Venezolano de Investigaciones Cien-

tificas, Caracas. C. Schubert.

Acta Cient Venez. Vol 23, No 3, p 108-114. 1972. Illus. (English summary).

*Venezuela(Andes area), *Periglacial areas.

Striated ground was found above 3600 m elevation in paramo de La Culata, Pico Espejo, and in the vicinity of Timoncito Glacier, in the Central part of the Venezuelan Andes. This ground is formed by the nightly freezing and diurnal melting of the water contained by the soil. The striae are a consequence of the alignment of lumps of fine to coarse sand, separated by small discontinuous channels, approximately 1-3 cm wide. The sur-faces of striated ground generally are not wider than 1 m. Sorting was observed in the form of peb-ble-rich and pebble-poor zones. Striated ground in process of formation was observed in Pico Espejo.
The needle ice, formed during the nocturnal freeze, filled the channels between striae. No sorting was observed, which is a probable indication of very recent formation of the feature, probably the night before. The orientation of the striae is compared with the wind direction measured in Pico Espejo. The formation of needle ice in the ground reflects the direction of the freezing wind Copyright 1973, Biological Abstracts, Inc. W74-04651 and produces striae oriented in that direction--

WATER REGIME IN ALLUVIAL FAN SOILS OF THE ARAKS RIVER, (IN RUSSIAN),

M. R. Abduev. Izv Akad Nauk SSR Ser Biol Nauk. 4, p 47-53. 1971. Illus.

Identifiers: *Alluvial fan soils, Rivers, Soils, *USSR(Araks River), Groundwater, *Soil

From 1962-1965 small plots were laid out to include all soil diversity. The water regime in this alluvial fan is quite complex not only in separate zones of soils, but also in individual areas. At the same time some humidification and moisture dynamism appeared to be of more general character to these soils. A layer of pronounced humidification was marked in all plots, which increased in the direction of decreased slope. This must have been linked with the rise of ground water in this direction. Also the pronounced dynamism of moisture content in the profile of these soils seemed to be a common characteristic.-Copyright 1973, Biological Abstracts, Inc. W74-04733

SPECTROPHOTOMETRIC ESTIMATION OF ARSENIC IN NITRIC ACID EXTRACTS OF SOIL AND SOIL ADDITIVES,

National Vegetable Research Station, Wellsbourne (England).
For primary bibliographic entry see Field 5A. W74-04769

Group 2G—Water In Soils

EFFECTS OF SALT CONCENTRATION CHANGES DURING FREEZING ON THE UN-FROZEN WATER CONTENT OF POROUS MATERIALS, Cold Regions Research and Engineering Lab.,

Hanover, N.H. For primary bibliographic entry see Field 2C.

WATER FLOW THROUGH SNOW OVERLY-ING AN IMPERMEABLE BOUNDARY, Cold Regions Research and Engineering Lab., Hanover, N.H.

For primary bibliographic entry see Field 2C.

W74-04803

WATER CONDITIONS IN SOILS OF THE BOGAR ZONE OF THE UZBEK SSR, A. A. Rode

Available from NTIS, Springfield, Va. 22151 as TT-70-57115 for \$3.00 printed copy; \$1.45 microfiche. Indian National Scientific Documentation Centre, New Delhi, Technical Translation Report TT-70-57115, 1972. 53 p, 11 fig, 10 tab, 15 ref. (Originally published in Akademiya Nauk SSSR, Trudy Pochevennogo Instituta im. Dokuchaeva, Vol 25, p 94-129, 1947).

Descriptors: *Soil moisture, *Water balance, Soil water movement, Soil management, Mulching. Identifiers: *USSR(Uzbek SSR-Bogar zone).

The water regime of soils of the bogar zone of the Uzbek SSR is of the impermacidal type (according to the terminology of Vysotskii). The annual depth of moisture penetration does not exceed 1 m and the water content which attains the value of waterholding capacity of soils rarely exists beyond this depth. The moisture exchange as a whole takes place in the soil layers only to the depth of 2.5 m. The soil moisture during a year varies from the values somewhat exceeding water holding capacity (field water capacity) to wilting moisture. The moisture reserve in soils starts increasing from the end of October and attains the maximum value in the end of March or beginning of April. After this period it starts decreasing until the precipitation stops. In summer months when the moisture reserve approaches the minimum value, its rate of decrease again falls. The soils which are under crops or wild plants lose all the moisture they receive in form of precipitation. The soils which are not covered with plants (bare fallow) lose less than the loss in case of soils covered with plants. Therefore, bare fallow, if properly cared, serves as a means to preserve moisture. (Knapp-USGS) W74-04809

2H. Lakes

REMOTE SENSING IN SAMPLING SITE LOCA-TION IN LAKES AND STREAMS. Kentucky Univ., Lexington. Dept. of Civil En-

gineering.
For primary bibliographic entry see Field 5A.

NUTRIENT INCOME CHANGE RELATED TO PLANKTON ALGAE, Washington Univ., Seattle. Dept. of Civil En-

gineering. For primary bibliographic entry see Field 5C. W74-04318

LITTORAL TRANSPORT IN THE GREAT

United States Lake Survey, Detroit, Mich. For primary bibliographic entry see Field 2J. W74-04334

MODIFICATION OF NEARSHORE CURRENTS BY COASTAL STRUCTURES, United States Lake Survey, Detroit, Mich. For primary bibliographic entry see Field 8B.

CURRENTS AT HARBOR BEACH, MICHIGAN, United States Lake Survey, Detroit, Mich. For primary bibliographic entry see Field 5B.

VERTICAL DISTRIBUTION OF FISHES RELA-TIVE TO PHYSICAL, CHEMICAL AND BIOLOGICAL FEATURES IN TWO CENTRAL ARIZONA RESERVOIRS,

Arizona State Univ., Tempe. For primary bibliographic entry see Field 5C.

NUTRIENTS IN SUBSURFACE AND RUNOFF WATERS OF THE HOLLAND MARSH, ON-

Ministry of the Environment, Rexdale (Ontario). Water Quality Branch. For primary bibliographic entry see Field 5B. W74-04478

RELATIVE SUSCEPTIBILITY OF LAKES TO WATER-QUALITY DEGRADATION IN THE SOUTHERN HOOD CANAL AREA, WASHING-

Geological Survey, Tacoma, Wash. For primary bibliographic entry see Field 5B. W74-04488

LAKES IN THE BOULDER-FORT COLLINS-GREELEY AREA, FRONT RANGE URBAN CORRIDOR, COLORADO,

Geological Survey, Washington, D.C.
J. F. Ficke, and T. W. Danielson.
For sale by USGS, Washington, D.C. 20244, Price \$0.75. Miscellaneous Investigations Series Map I-855-A, 1973. 1 sheet, 1 map, 1 tab.

Descriptors: *Water quality, Lakes, *Mapping, *Colorado, *Specific conductivity, Data collections, Surveys, Dissolved solids, Water types, Light penetration, Secchi disks, Biological properties, Algae, Reviews.
Identifiers: *Lakes inventory(Colo).

Results are summarized of an inventory of the lakes in the northern one-third of the Colorado Front Range Urban Corridor. The inventory was conducted to assemble information that might be helpful in planning the best and most beneficial use of lakes in an area of rapid population growth. Lake size and water-quality data are included. Size data include most of the lakes of 2 hectares (20,000 square meters, about 5 acres) or greater. Waterquality data are provided for most lakes larger than 10 hectares (about 25 acres). As expressed by values of specific conductance is micromhos per centimeter, most of the lakes contained water of good quality. Conductance was 750 or less in 57 of the 115 lakes measured; it ranged from 750 to 1,500 in 30 lakes, ranged from 1,500 to 4,500 in 21 lakes, and exceeded 4,500 in only 7 lakes. Samples from Button Rock Reservoir, Flatiron Reservoir, and Pinewood Lake had specific conductance less than 40. The highest conductance waters were from Coleman Reservoir (12,000), Newell Lake (12,500), and 27 unnamed lake (15,000) located 3.5 kilometers north-northeast of Berthoud. Most of the lakes in the corridor contained water that is alkaline. Transparency, as measured by a Secchi disk, was less than 1.2 meters in 87 of the 112 lakes ranged from 77 to 13,000 cells per milliliter in sam-ples collected from 23 lakes. (Woodard-USGS) W74-04496 in which it was measured. Algal concentrations A PRELIMINARY SURVEY OF THE POSSIBLE CONTAMINATION OF LAKE NAKURU IN KENYA WITH SOME METALS AND CHLORINATED HYDROCARBON PESTI-

CIDES, Utrecht Rijksuniversiteit (Netherlands). Inst. of Pharmacology and Biological Tox-Veterinary icology.

nary bibliographic entry see Field 5C. For primar W74-04547

WATER LEVEL FLUCTUATIONS OF THE CASPIAN SEA (K PROBLEME UROVENNOGO REZHIMA KASPIYSKOGO MORYA), Akademiya Nauk SSSR, Moscow. Institut Vod-nykh Problem.

D. Ya. Ratkovich, I. S. Zhdanova, and V. Ye.

Vodnyye Resursy, No 3, p 45-69, 1973. 9 fig, 8 tab,

Descriptors: *Lakes, *Water levels, *Water level fluctuations, Variability, Water balance, Inflow, Evaporation, Runoff, Statistical methods, Statistical models, Probability, Forecasting, Curves, Equations Equations.
Identifiers: *USSR, *Caspian Sea.

The level of the Caspain Sea is undergoing fluctuations induced by the natural variability of inflow to the sea and of evaporation from its surface. Under present climatic conditions the range of natural fluctuations in level may be about 3 m. As a result of withdrawals of runoff from rivers of the Caspian basin, the average level of the sea has dropped by about 2 m to its present elevation of about 28.5 m below sea level. A further decline in level by more than 1.0-1.5 m will inflict great damage on fish stocks of the sea. Under average hydrometeorological conditions and with an intensive increase in water consumption, the level of the sea may decline an additional 2.0-2.5 m by the year 2000. Measures to replenish the water resources of the sea and to curtail evaporation from its surface can, to a great extent, prevent a further drop in sea level and avoid severe con-sequences for the national economy of the country. According to preliminary data, it is quite possible to hold the further decline in sea level to about 1 m. (Josefson-USGS)
W74-04575

WAVE ACTION AND BREAKWATER DESIGN, HAMLIN BEACH HARBOR, NEW YORK, Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab. For primary bibliographic entry see Field 8B. W74-04588

BENTHIC FAUNA OF A TROPICAL MAN-MADE LAKE (VOLTA LAKE, GHANA 1965-1968).

Makerere Univ., Kampala (Uganda). Dept. of Zoology. T. Petr.

Arch Hydrobiol. Vol 70, No 4, p 484-533. 1972, Illus. Identifiers: *Benthic fauna, *Chaoborid. *Chironomids Ecology *Ephemeroptera(Nymphs), *Ghana(Volta Lake), Tropical lakes, Invertebrates, Macrophytes.

Quantitative and qualitative changes in the individual taxa of the bottom fauna were followed in the Volta man-made lake over the filling period 1965-1968. The changes in the individual inver-tebrate taxa during this period are considered in relation to the changes environmental factors, such as oxygen content, substratum, degree of ex posure to waves, and establishment of littoral aquatic macrophytes. The ecology of chironomids, ephemeropteran nymphs and chaoborid larvae is discussed in detail.—Copyright 1973, Biological Abstracts, Inc. W74-04636

THE RELATION BETWEEN PHYTOPLANK-TON AND PHOSPHATE IN THE LAKE OF CONSTANCE, (IN GERMAN),

Staatliches Institut fuer Seenforschung und Seenbewirtschaftung, Konstanz (West Germany). Ab-teilung Max Auerbach-Institut. For primary bibliographic entry see Field 5C. W74-04637

ECOLOGICAL CHARACTERISTICS OF GO-NO-IKE LAKE, Tokyo Univ. (Japan). Ocean Research Inst.

For primary bibliographic entry see Field 5C.

FISHERY SURVEY CARRIED OUT AT LAKE BORULLUS, A. R. E., IN THE SPRING OF 1971. (IN CZECH), Ceskoslovenska Akademie Ved. Brno. Ustav pro

Vyzkum Obratlovcu.

J. Libosvarsky, S. Lusk, and H. Mohamed El-Sedfy.

Prirodeved Pr Ustavu Cesk Akad Ved Brne. Vol 6. No 7, p 1-41. 1972. Illus.

Identifiers: Atherina-mochon, Cichlids, Clarias-lazera, *Fishery survey, Lakes, Mugil-capito, Mugil-cephalus, Solea-solea, Spring, Survey, Fish catch, *Lake Borullus(A.R.E.), *Nile Delta.

A joint research program was carried out at Lake Borullus, I of the coastal lakes of the Nile Delta. Of 29 fish species caught: 6 were marine, 6 were diadromous species, 4 belong to brackish water inhabitants, 12 were Nile fishes and 1 was an introduced species. The catch per unit of effort in the spring was checked both by test fishing and via inspections of bags of commercial fishermen. With trammel nets the catch per unit of effort varied from 2 individuals of fish and 49 g of fish flesh (in daytime settings) to 14 individuals and 235 g (in overnight settings). Trammel net adapted for beach seining yielded 16 individuals and 206 g. The beach seining for fry returned 126 individuals and 210 g of fish/haul. The bodies of 3 spp of grey mullets, Solea solea, Clarias lazera and Atherina mochon, analyzed for dry matter, fat and ash contents and caloric value of 1 g dry matter showed higher nutritive value (over 5000 cal) than the bodies of cichlids (between 4 and 5000 cal). The length distributions in catches supported by scale readings show that, in spring, the population of Mugil cephalus consisted largely of 1 group (the youngs-of-the-year), while the population of M. capito was formed mainly by 2 age groups (the youngs-of-the-year and the age class I). Thus the exploitation was rather heavy and reproduction lay on the first spawning fish. Nevertheless, the large amount of fry of both species found over large areas of the lake indicated that the populations still existed on a sustained basis.—Copyright 1973, Biological Abstracts, Inc. W74-04643

LITTORAL VEGETATION OVERGROWING IN SOME LAKES OF KALININ DISTRICT, (IN RUSSINA),

Akademiya Nauk SSSR, Moscow, Institut

Geografii. N. Ya. Mironova.

Gidrobiol Zh. Vol 8, No 5, p 14-20. 1972. (English

Identifiers: Lakes, *Littoral, *USSR(Kalinin lakes), *Vegetation overgrowth.

The comparative analysis of the littoral vegetation overgrowing in 9 environmentally different lakes (in USSR) is given. There are outlined 4 lake groups with different types of vegetation, determined by coaction of regulatory factors, such as water transparency, littoral structure, character of the bottom deposits.--Copyright 1973, Biological Abstracts, Inc.

SUBGLACIAL DEVELOPMENT OF CHLOREL-LA IN BAIKAL, (IN RUSSIAN), Irkutskii Gosudarstvennyi Universitet (USSR).

G. F. Zagorenko.

Dokl Akad Nauk SSSR Ser Biol. Vol 206, No 5, p 1223-1225. 1972. Illus. Identifiers: *Chlorella, *Lake Baikal, *Subglacial development, *USSR, Algae.

Chlorella were collected from the subglacial waters of Lake Baikal (USSR) at various depths on March 3, 15, 22, 28, 29, 1971 and 2 24-hr series of samples taken Mar 5-6 and 18-19, 1971. The quantity of Chlorella at various depths varied during the observation period from 20,000 to 190,000 cells/1. Redistribution of the population of Chlorella during the 24-hr period was not observed, and its maximum number of cells was noted at a depth of 10-20 m.--Copyright 1973, Biological Abstracts, Inc. W74-04647

PHYTOPLANKTON DYNAMICS IN THE SEVERSKIY DONETS RIVER FOR THE FIRST YEARS AFTER ITS REGULATION, (IN RUS-

Kharkov State Univ (USSR) For primary bibliographic entry see Field 5C. W74-04648

DETAILED TIME VARIATIONS IN MEAN TEMPERATURE AND HEAT CONTENT OF SOME MADISON LAKES, State Univ. of New York, Buffalo, Dept. of Biolo-

K. M. Stewart.

Limnology and Oceanography, Vol 18, No 2, p 218-226, March, 1973. 4 fig, 1 tab, 28 ref.

Descriptors: Limnology, *Wisconsin, *Water temperature, Lakes, Climatology, Thermal properties, Lake morphometry, On-site data collections, Seasonal, Fluctuations, Annual, Diurnal, Sampling, Thermal pollution, *Heat budget, Water pollution, Data collections, Equilibrium, *Time series

analysis.

Identifiers: *Lake Mendota(Wis), Heat content,
*Lake Monona(Wis), *Lake Waubesa(Wis).

Detailed variations in mean temperature and heat content were studied for 5 years in Lake Mendota and 3 years in Lakes Monona, and Waubesa near Madison, Wisconsin. The data show that heat content may vary significantly within 2 or 3 days and that the specific time of maximum heat content is unpredictable. Accurate determinations of heat budgets require frequent sampling over long periods. A Birgean annual heat budget may not necessarily reflect the influence of a lake on the surrounding environment. Thermal discharges had little influence in determining the mean temperatures of Lake Monana. (Jerome-Vanderbilt)

THE THERMAL REGIME OF LAKE LANAO (PHILIPPINES) AND ITS THEORETICAL IMPLICATIONS FOR TROPICAL LAKES, Indiana Univ., Bloomington. Dept. of Zoology.

W. M. Lewis, Jr.

Limnology and Oceanography, Vol 18, No 2, p 200-217, March 1973, 14 fig, 1 tab, 27 ref.

Descriptors: *Limnology, *Lake morphology, *Thermal stratification, *Water temperature, Lakes, Tropical regions, Climatology, Thermal properties, Thermocline, Seasonal, Turbulence, Mixing, On-site data collections, Analytical techniques, Heat budget, Winds, Hypolimnion, Aisterneture Air temperature.

Identifiers: *Thermal inversion, *Philippines(Lake Lanao)

A study of temperature records, climatic profiles, and chemical data over 14 months for Lake Lanao, a low altitude tropical lake, shows that the annual pattern of heat distribution depends partly on a seasonal air temperature minimum and partly on nonseasonal climatic changes. The lake circulated during January and February at the time of seasonal cooling, was intermittently stable during March and April and was stratified during all other months. During stratification the principal thermocline achieved equilbrium with storm winds at 40-50 m. Secondary and tertiary thermoclines repeatedly split the epilimnion into an upper turbu-lent layer and a lower stagnant layer for periods of up to 2 months, but were displaced or dissipated at irregular intervals by storms. Changes in the shape of the thermal profile in the lake included sharpening of thermoclines by wind and convection, smearing of thermoclines by internal water movements, unstable thermal inversions due to surface cooling, and stable thermal inversions on the bottom resulting from heat retention during cool months. (Jerome-Vanderbilt) W74-04665

CHIRONOMIDAE (DIPTERA) FROM THE AREA OF FREIBURG IN BREISGAU (WITH SPECIAL CONSIDERATION OF THE GENUS CHIRONOMUS), (IN GERMAN), Freiburg Univ. (West Germany).

E. Krieger-Wolff, and W. Wuelker.

Beitr Naturkd Forsch Suedwestdtsch. Vol 30, No 2, p 133-145. 1971. Illus.

Identifiers: Chironomidae, *Chironomus spp, Chironomus-Dorsalis, Chironomus-Luridus, Chironomus-Melanotus. *Diptera, *Germany(Freiburg-im-Breisgraw).

Over 50 chironomid species reported in the literature for southern Black Forest region (West Germany) are listed with author and location of find. Chironomus from the Black Forest and Rhine lowlands (15 spp.), determined by chromosome analysis, are briefly discussed and their localities are listed. C. luridus was most frequent in the pools of the area, followed by C. melanotus. C. dorsalis has adapted to life in temporary waters (puddles) with the ability to withstand dessication. However, a more permanent body of water to serve as a reservoir in case of long drought oc-curred near each find. With remarkable regularity 3 different Chironomus species were found in equal abundance at the small pools. These species may undergo temporally different population development so that total competition did not occur.—Copyright 1973, Biological Abstracts, Inc. W74-04678

RELATION BETWEEN THE AMOUNT OF NET ZOOPLANKTON AND THE DEPTH OF STATION IN SHALLOW LIPNO RESERVOIR, Ceskoslovenska Akademie Ved, Pr Hydrobiologicka Lab. For primary bibliographic entry see Field 5C. W74-04680

CHEMICAL ECOLOGY: EVIDENCE FOR PHOSPHATE AS THE ONLY FACTOR LIMIT-ING ALGAL GROWTH IN LAKE KINNERET, Weizmann Inst. of Science, Rehovoth (Israel). Isotope Dept. For primary bibliographic entry see Field 5C. W74-04685

SEX CYCLE, SPAWNING AND FERTILITY OF WEST SIBERIAN CRUCIANS IN THE STEPPE LAKES, (IN RUSSIAN), Akademiya Nauk SSSR, Novosibirsk. Institut

Biologii.

M. V. Volgin, and V. M. Anchutin.
Izv Sib Otd Akad Nauk SSSR Ser Biol Med Nauk. 3: p 102-105, 1972, Illus. (English summary). Identifiers: *Crucians(Siberian), *Fertility, Growth stages, Lakes, Sex, *Spawning, Survival, *USSR(Steppe lakes), *Fish reproduction. *Fertility,

Group 2H-Lakes

The west Siberian golden and silver crucians spawn once in spite of having 4 generations of ovules in their ovary. It is an adaptation of crucians to the complex conditions in the west Siberian lakes(USSR). Fertility of crucians is not high. The golden crucians have higher fertility than the silver one, but silver crucians grow and survive better.--Copyright 1973, Biological Abstracts, Inc. W74-04689

THE FEEDING OF PELECUS CULTRATUS L. IN KAIRAKKUM RESERVOIR, (IN RUSSIAN), Akademiya Nauk Tadzhikskoi SSR, Dushanbe. Institut Zoologii i Parazitologii.

L. V. Kondur. Dokl Akad Nauk Tadzh SSR. Vol 15, No 9, p 60-

63. 1972. Illus. Identifiers: *Feeding habits. *Pelecus-Cultratus. Reservoirs, Seasonal, *USSR(Kairakkum reser-

The feeding habits of Pelecus cultratus (in Kairakkum Reservoir, USSR) were studied at various stages of development. The intestines of 99 fish of 21-33.5 cm length, 38 of which were found to be empty, were examined. Seasonal increments were noted together with characteristic changes in the feeding content.--Copyright 1973, Biological Ab-W74-04695

MORPHOLOGICAL VARIATION KERATELLA COCHLEARIS (GO (ROTATORIA) IN SEVERAL MASUR LAKES OF DIFFERENT TROPHIC LEVEL, (GOSSE) MASURIAN Polish Academy of Sciences, Warsaw. Inst. of Ecology.

For primary bibliographic entry see Field 5C. W74-04696

HETEROTROPHIC UTILIZATION SUCROSE IN AN ARTIFICIALLY ENRICHED LAKE, Manitoba Univ., Winnipeg. Dept. of Microbiology.

For primary bibliographic entry see Field 5C. W74-04781

MEASUREMENT OF ADENOSINE TRIPHOSPHATE (ATP) IN TWO PRECAMBRI-ADENOSINE AN SHIELD LAKES OF NORTHWESTERN ON-

Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.

For primary bibliographic entry see Field 5B. W74-04782

MOVEMENTS OF PHOSPHORUS BETWEEN ITS BIOLOGICALLY IMPORTANT FORMS IN

LAKE WATER, Department of Energy, Mines and Resources, Burlington (Ontario). Canada Center for Inland Waters.

For primary bibliographic entry see Field 5B. W74-04783

DIURNAL VARIATION OF DISSOLVED INOR-GANIC CARBON AND ITS USE IN ESTIMAT-ING PRIMARY PRODUCTION AND CO2 INVA-SION IN LAKE 227, Fisheries Research Board of Canada, Winnipeg

(Manitoba). Freshwater Inst.

For primary bibliographic entry see Field 5A. W74-04784

DISTRIBUTION AND UPTAKE OF ARTIFI-CIALLY INTRODUCED RADIUM-226 IN A SMALL LAKE.

Lamont-Doherty Geological Observatory, Palisades, N.Y. For primary bibliographic entry see Field 5B. W74-04785

A NUMERICAL MODEL FOR DETERMINING INTEGRAL PRIMARY PRODUCTION AND ITS APPLICATION TO LAKE MICHIGAN, Wisconsin Univ., Milwaukee. Center for Great

Lakes Studies For primary bibliographic entry see Field 5C.

PRODUCTION OF EPILITHIPHYTON IN TWO LAKES OF THE EXPERIMENTAL LAKES AREA, NORTHWESTERN ONTARIO, Fisheries Research Board of Canada, Winnipeg

(Manitoba), Freshwater Inst. For primary bibliographic entry see Field 5C. W74-04787

EUTROPHICATION OF LAKE 227 BY ADDITION OF PHOSPHATE AND NITRATE: THE SECOND, THIRD, AND FOURTH YEARS OF ENRICHMENT, 1970, 1971, AND 1972, Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.

For primary bibliographic entry see Field 5C. W74-04789

A REPORT ON THE LIMNOLOGY OF MON-ROE RESERVOIR, INDIANA, Indiana Univ., Bloomington. School of Public and Environmental Affairs.

B. R. Allanson, C. J. Zimmerman, and D. K.

Occasional Papers, No 1, January 1973. 53 p, 12 fig, 15 tab, 18 ref.

Descriptors: *Limnology, *Reservoirs, *Indiana, Water quality, Water analysis, Physicochemical properties, Lake morphology, Aquatic life, Ecosystems, Water temperature, Biological properties, Data collections, Reviews, Water quality control, Water utilization.

Identifiers: *Monroe Reservoir(Ind).

Monroe Reservoir was established in Indiana in 1964-65 by damming the flow of Salt Creek, resulting in the biggest manmade lake in Indiana. It has become an important recreation center for the State, quite apart from its resource as a water for the town of Bloomington and associated industry. Because of its obvious importance to the State, the reservoir should be retained in as acceptable condition as possible. To accomplish this, much serious effort by all the users, both private and state, will be required to carry out an effective program of water quality control. To provide a basis for future comparisons, all existing knowledge about the limnology of the reservoir, including some new information, is presented. Data tabulated or illustrated include sampling sites, temperature profiles, oxygen profiles, lake bottom profiles, specific con-ductance, hydrogen ion concentrations, phosphorus content, nitrogen content, eutrophication, zooplankton densities, and bacterial popula-tions. During 1968 and 1971, maximum Secchi disc transparencies occurred in late August-early September in both years. Transparency also increased toward the dam during 1971 and was lowest in the North and Middle Forks. (Woodard-USGS)

VERIFICATION OF WATER TEMPERATURE FORECASTS FOR DEEP, STRATIFIED RESER-

Oregon State Univ., Corvallis. School of Oceanography. For primary bibliographic entry see Field 4A. W74-04807

HORIZONTAL DISTRIBUTION OF SOME CHEMICAL AND PHYSICAL CHARAC-TERISTICS IN LIPNO RESERVOIR, Ceskoslovenska Akademie Hydrobiologicka Lab. Ved. For primary bibliographic entry see Field 5C.

W74-04814

COMPARATIVE STUDY, IN 1966 AND 1967, OF THREE RESERVOIRS IN THE PROJECT OF A NATURAL PARK IN THE MORVAN REGION

Institut National de la Recherche Agronomique, Thonon-les-Bains (France). Si d'Hydrobiologie Lacustre. For primary bibliographic entry see Field 5C. W74-04815

MICRO- AND MESOBENTHOS DEVELOP-MENT AS A FACTOR OF SOIL COMPOSITION (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut

Hidrobiologii.

V. V. Gurvich, E. P. Nakhshina, and I. K. Palamarchuk.

Gidrobiol Zh. 8(4): p 27-34, Illus, 1972, English summary

Identifiers: *Benthos, Minerals, *Organic matter,
*Soils, *USSR(Kakhovka reservoir), Zinc,
Copper, Cobalt, Manganese.

Observations in the Kakhovka reservoir, USSR, showed the dependence of micro- and mesobenthic organism development on soil composition organic matter and microelement (Mn, Zn, Cu, Co) contents.—Copyright 1973, Biological Abstracts, Inc. W74-04816

ECOLOGY AND BIOCOENOLOGY OF LAGU-NAS OR LAKES OF THIRD ORDER OF THE TEMPERATE NEOTROPICAL REGION (SOUTHEAST PAMPASIC REGION OF ARGEN-

TINA), (IN SPANISH), La Plata Univ. (Argentina). Instituto de Lim-

R. A. Ringuelet.

Physis (B Aires). 31(82): p 55-76, 1972, English

*Hotorian Algae, *Argentina(Pampasic region), *Biocenology, Crustaceans, *Ecology, Fish, Genetics, Hydrochemistry, Hydrophytes, Lagunas, Lakes, Neotropical regions, Plankton, Rotifers, Temperate, Thermal stress.

A great program of limnological research was in-A great program of miningers and program of the Southeast Pampasic region of Argentina. A definition of terms is followed by an explanation of genetic processes and a summary of geomorphic characteristics and the thermal budget. Hydrochemically the 'lagunas' are classified ac-cording to their salinity and ionic composition, recalling the most marked annual fluctuations. Information about phytoplankton and zooplankton, with numerical data is presented. The plankton is an 'Eulimnoplankton,' frequently with adventitious elements; the zooplankton is dominated by naupli or ritifers; the annual variations show 2 peaks, in autumn and in spring; the winter minimum is moderated and ecological factors permit the reproduction of algae and animals. There are 2 plankton types, oligonaline and mesohaline, with rotifers and microcrustacean indictors. An account of the mesofauna from euplenston, bafon and benthos is given, as well as data on hydrophytes, numerosity and biomass. Population studies on fishes reveal that a typical 'laguna,' studies on fishes reveal that a typical 'laguna,' such as Chascomus, has 16 spp., each computed in numbers and biomasses. The silverside of 'pejerrey' has a strict relation with size of microcrustaceans of the plankton, and the yield of planktonic fishes of 'lagunas' varies accordingly. There are 2 general types of 'lagunas,' characterized by their chemical composition, hydrophytes and plankton, whose successions are very different (halitrophic and saprotrophic types) in relation with the regional climatic factors.--Copyright 1973, Biological Abstracts, Inc. W74-04817

Water In Plants—Group 21

RATIO OF ORGANIC CARBON WITH DIF-FERENT TYPES OF OXIDIZABILITY IN THE OPEN WATER OF BAIKAL (IN RUSSIAN), For primary bibliographic entry see Field 5C. W74-04819

DISTRIBUTION OF ORGANIC MATTER AND BACTERIA IN THE UPPER LAYER OF BOTTOM DEPOSIT OF LAKE BALATON, Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.

For primary bibliographic entry see Field 5B. W74-04839

WAVE INTERACTION AND LANGMUIR CIR-CULATIONS, State Univ. of New York, Albany. Atmospheric

Sciences Research Center.
In: Physical Studies on Lake George and Lake Ontario, Lake George Studies Report No 6: State University of New York Atmospheric Sciences June 1971. 2 fig, 15 ref. (Reprinted from Proc of 11th Conference on Great Lakes Research, 1968.).

Descriptors: *Currents(Water), *Waves(Water), *Limnology, Lakes, Water circulation, Refrac-

*Limitology, was. tion(Water waves). Identifiers: *Langmuir circulation, *Waves inter-

The interaction of two trochoidal wave trains was examined numerically to compare the computed wave shapes and locations to the observation of streaking associated with Langmuir circulations. The wave trains approach each other at angles of 15, 20 and 25 deg. The resulting areas of maximum amplitude form apparent streaks and move across the field of vision, similar to the motion of streaks associated with Langmuir circulations. (Knapp-W74-04844

A FIELD STUDY OF LANGMUIR CIRCULA-TIONS, State Univ. of New York, Albany.

State Univ. of New York, Albany.

G. E. Myer.
In: Physical Studies on Lake George and Lake Ontario: Lake George Studies Report No 6: State University of New York Atmospheric Sciences Research Center Publication No 147, p 652-663, June 1971. 11 fig, 1 tab, 21 ref. (Reprinted from Proc of 12th Conference on Great Lakes Research, 1969).

Descriptors: *Waves(Water), *Currents(Water), *Water circulation, Lakes, Limnology, Winds, *New York.

*Langmuir circulation,

Under thermally stable conditions Langmuir circulations transport heat downward. Langmuir circulations are a major cause of epilimnion mixing and thermocline development and decline in lakes. inermocine development and decline in lakes. The Langmuir circulations appear to be coupled to the wind by some indirect mechanism. The mechanisms for this coupling which best fit field observations on Lake George, New York, are those acting as or very near the water surface. (Knapp-USGS) W74-04845

2I. Water In Plants

CHANGES IN ENZYMES IN THE PLANT AS RELATED TO WATER SUPPLY AND USAGE, California Univ., Davis. Dept. of Water Science

and Engineering.
T. C. Hsiao, and R. C. Huffaker.

Available from National Technical Information Service as PB-228 634, \$4.00 in paper copy. Completion Report, UCAL-WRC-70-W131, Completion Report, UCAL-WRC-70-WI March, 1970. 8 p. 14 ref. OWRR B-029-CAL(1).

Descriptors: *Enzymes, *Metabolism, Photsynthesis, Nitrogen, *Drought resistance, *Stomata, *Moisture stress, Plant physiology. Descriptors: Identifiers: Starch degradation.

The ultimate objective is to determine the mechanisms or controlling factors which regulate the adaption of plants to conditions where water is limiting. The immediate objectives have been (1) to determine the effects of water deficit on en-zymes required for the important biochemical zymes required for the important biochemical processes of nitrogen metabolism, photosynthesis, and starch degradation; (2) to relate changes in these processes caused by water stress to the growth of the plant and to its adaptation to drought; and (3) to study the control governing the opening and closing of stomata, the pores which regulate water loss from plants. W74-04306

CONCERNING LARGE-SCALE CULTIVATION
OF THERMOPHILIC COSMOPOLITAN
MASTIGOCLADUS LAMINOUSUS COHN
(CYANOPHYTA) IN ICELANDIC HOT

Eidgenoessische Technische Hochschule, Zurich (Switzerland). Institut fuer Molekularbiologie und

A. Binder, P. Locher, and H. Zuber. Arch Hydrobiol. Vol 70, No 4, p 451-555, 1972. Illus. English summary.

Identifiers: Chemistry, Cultivation, *Cyanophyta,

Flow, *Iceland, *Mastigocladus-Laminosus, Temperature. *Thermophilic animals. *Algae. perature, *Thermophilic animals, Hydrogen ion concentration, Hot Springs.

M. laminosus Cohn was found in great quantities in several Icelandic hot springs. The effects of pH, temperature, chemical composition and flowspeed of the water on growth of the organism were studied, and the optimum conditions for cultivation were determined. Based on these results a 5 m long flow-through channel was built in which to cultivate the algae.—Copyright 1973, Biological Abstracts, Inc. W74-04486

INFLUENCE OF ENVIRONMENTAL MOISTURE CONDITIONS ON THE PHENOL COMPOUND AMOUNT IN CALLUNA VUL-

GARIS L., J. Brachet, and N. Bichaut.

J. Brachet, and N. Bichaut. C R Hebd Seances Acad Sci Ser D Sci Nat. Vol 275, No 19, p 2137-2139, 1972. Illus. Identifiers: "Calluna-Vulgaris, Environmental stu-dies, "Phenol compound, "Soil moisture depletion.

The studies focused on the effect of moisture deprivation on the level of soluble phenol compounds in 2 lots of C. vulgaris L., adapted to moisture obtained by growing under controlled conditions. The simultaneous action to the atmospheric and edaphic moisture deprivation produces an increase in synthesis rate, more sig-nificant and earlier in the plant previously grown in a moist atmosphere.—Copyright 1973, Biological Abstracts, Inc. W74-04487

SCANNING ELECTRON MICROSCOPY OF FIXED, FROZEN, AND DRIED PROTOZOA, Illinois Univ., Urbana. Dept. of Zoology. For primary bibliographic entry see Field 7B.

PLANT RESPONSES TO WATER STRESS.

California Univ., Davis, Lab. of Plant-Water Rela-T. C. Hsiao.

Annual Review of Plant Physiology, Vol 24, p 519-

570, 1973. 330 ref.

Descriptors: *Reviews, *Bibliographies, *Plant physiology, *Water requirements, *Moisture

stress, Agronomy, *Soil-Water-Plant relationships, Plant pathology, Plant growth, Photosynthesis, Carbon dioxide, Metabolism, Nitrogen compounds, Cytological studies, Plant tissues, Plant growth substances, Enzymes, Respiration, Transpiration, Translocation. Identifiers: Cell walls

Based largely upon the literature published during the past decade, this review deals with current knowledge (and lack of knowledge) concerning parameters that indicate the status of water in plants, observed physiological and biochemical responses to water stress, and mechanisms underlying such responses as transpiration, carbon dioxide assimilation, respiration, cell growth, cell wall synthesis, cell division, hormonal activity, enzyme levels, nitrogen metabolism, ion transport, and photosynthate translocation. (Brown-IPC) W74-04539

WATER IN WOOD,

State Univ. of New York, Syracuse. Coll. of Forestry.

Syracuse University Press, Syracuse, New York, 1972, 218 p, 185 ref. Price: \$12.50.

Descriptors: *Lumber, *Moisture content, *Moisture uptake, *Vascular tissues, *Humidity, *Hygroscopic water, Vapor pressure, Thermodynamics, Thermodynamic behavior, Water properties, Water types, Moisture tension, Water vapor, Absorption, Adsorption, Capillary water, Description, Properties Porosity, Permeability, Evaporation, Osmotic

Identifiers: *Wood, Moisture equilibria, Dimensional stability, Swelling.

This fundamental text on wood-water relationships provides a unified theoretical treatment of all important physical phenomena relating to te behavior of wood in response to changes in moisture content. The five chapters deal with the following topics: Physics of water (vapor pressure, capillary and osmotic pressure, evaporation, freezing, sublimation, etc.); Wood moisture and the environment (hydrogen bonding, water sorption, moisture content and measurement, processing effect on wood moisture, etc.); Hygroscopic shrinkage and swelling (dimensional stabili-ty, anisotropy, etc.); Thermodynamics of moisture sorption (heats of sorption and of wetting, swelling pressure, thermo- and hygroelasticities, etc.); and Theories of water sorption proposed by various researchers to explain the equilibrium moisture content of wood in relation to atmospheric condiword in relation to atmosphere continuous. A subject index is appended. (Brown-IPC) W74-04545

OBSERVATIONS ON THE VEGETATION OF THE KORONOWO RESERVOIR,

Nicolas Copernicus Univ. of Torun (Poland). Inst. of Biology.

K. Kepczynski, and M. Ceynowa-Gieldon. Stud Soc Sci Torun Sect D (Bot). Vol 9, No 4, p 1-68. 1972. Illus.

Identifiers: Alder, Bidens-cernuus, Bidens-con-natus, Bidens-melanocarpus, Ceratophyllumcanadensis, Flooding, Heleocharis-palustris, Poland(Koronowo reservoir), Potamogetonnatans, Reservoirs, *Succession(Plants), *Swamps, *Vegetation. demersum, Ceratophyllum-submersum, Elodea-

The occurrence and succession of plants in the Koronowo reservoir area (Poland) after the construction of the dam on the Brda River in 1959 was observed. The initial flooding produced numerous small pools in nearby forests, meadows and cultivated fields. Shortly after the flooding, floating islands occurred in the reservoir which were the result of loosening of the flooded peat bogs, alder swamps and lowland forests. The plants of these islands made up the major source of distribution of swamp, reed and bush plants. The major pools

Group 21-Water In Plants

were first settled by water plants, so that in the first yr after construction of the dam Elodea canadensis, Ceratophyllum demersum, C. submersum, Potamogeton natans and other water plants previously only known to occur in the Brda River bed were observed in these pools. On the banks of the reservoir first swamp vegetation, then after some years, reeds occurred. In the isolated small pools in the forests, swamp plants, most significantly Bidens cernuus, appeared first, followed by reeds and aquatic plants. Present vegetation is species-poor spotty. Typical plant associations were lacking in the reservoir; most of the present stands have transitional character. A total 558 spp. were collected in the reservoir and on its banks. B. connatus and B. melanocarpus were first found in this area after construction of the dam. The most important associations of the reservoir area are at present the Myriophyllo-Nupharetum in its initial stage, the Sagittario-Sparaganietum, Scirpo-Phragmitetum and Glycerietum aquaticae and stands containing P. natans, Heleocharis palustris and B. cernuus.—Copyright 1973, Biological Abstracts, Inc.

WATER WITHDRAWAL BY PLANT ROOTS, Institute for Land and Water Management Research, Wageningen (Netherlands). For primary bibliographic entry see Field 3F. W74-04655

DAILY DIET AND RATE OF FEEDING OF NOTOTHENIA ROSSI MARMORATA FISCHER AND DISSOSTICHUS ELEGINOIDES SMITT, FAMILY NOTOTHENIDAE, IN THE AREA OF SOUTHERN GEORGIA (USSR), (IN RUSSIAN), All-Union Research Inst. of Marine Fisheries and Oceanography, Moscow (USSR).

M. I. Tarverdieva.

Vopr Ikhtiol. Vol 12, No 4, p 748-756. 1972. Illus. Identifiers: Ctenophora, *Daily diet, *Dissostichus-Eleginoides, Euphausia-Superba, Fish, *Notothenia-Rossi-Marmorata, Nototheniidae, *USSR(Georgia), Feeding rate.

In March 1971, the basic food of N. rossi marmorata was Ctenophora, that of D. eleginoides was fish. During this period, feeding increased during the second half of the day and decreased in the morning. N. rossi consumed intensively for 15 hr, D. eleginoides for 19 hr with breaks of 13 and 10 hr, respectively. In May, when N. rossi consumed Euphausia superba, feeding increased at about 41:00 a.m. and decreased at about 4:00 p.m. The daily ration was computed by 2 methods.—Copyright 1973, Biological Abstracts, Inc. WY4-04679.

CONTRIBUTION TO KNOWLEDGE ABOUT THE LEAF ANATOMY OF SPECIES OF A 'CAATINGA' OF THE RIO NEGRO (AMAZON), (IN PORTUGUESE),

Sao Paulo Univ. (Brazil). Inst. of Bio-Sciences. B. L. DeMorretes, and M. G. Ferri. Rek Biol (Lisb). Vol 8, No 1-4, p 97-122. 1972.

Rek Biol (Lisb). Vol 8, No 1-4, p 97-122. 1972. Illus. (English summary). Identifiers: *Amazon region(Rio Negro), Bactris-

Identifiers: *Amazon region(Rio Negro), Bacurscuspidata, *Caatinga, Clusia-spathulaefolia, Compsoneura-debilis, *Leaf, Oligotrophic, Pagamea-coriacea, Scleromorpism, Sphaeradenia-amazonica, *Evergreen scrubs.

A 'caatinga' is a type of low scrubby evergreen forest on local areas of white sand. Species treated are Bactris cuspidata Mart., Clusia spathulaefolia Engl., Compsoneura debilis Warb., Pagamea coriacea Spruce, Retiniphyllum truncatum Mull. Arg. and Sphaeradenia amazonica Harling. The yearly rainfall in the region may be more than 4000 mm and there is hardly a month with less than 100 mm. Average temperatures and relative humidity are high. Soils are generally very sandy and poor. Several structures that are usually considered

xeromorphic features are described: thick cuticle and cuticular layers, water-storing tissues, stomates in depressions, mechanical tissues, etc. The idea of oligotrophic scleromorphism presented by several authors in connection with other types of vegetation, such as the 'cerrado' which grows in places where soil water is not lacking but the soils are also in general very poor, is supported.—Copyright 1973, Biological Abstracts, Inc.
W74-04682

BOG VEGETATION RE-MAPPED AFTER SIXTY YEARS: STUDIES ON SKAGERSHUL-AMOSSEN, CENTRAL SWEDEN,

I. Backeus.
Oikos. Vol 23, No 3, p 384-393. 1972. Illus.
Identifiers:
*Sweden(Skagershultamossen),
Mapping.
*Vegetation,

Two areas were mapped. The new maps were compared with maps of the same areas from 1910, made by L. von Post. The vegetation changes are small. The open water surfaces have diminished in number and extent. The theory of cyclic succession on peat bogs finds no support from the maps. Plant communities have been delimited to correspond to those on the old maps and defined through analysis of a number of sample plots.—Copyright 1973, Biological Abstracts, Inc. W74-0468.

AEDES AEGYPTI AND AEDES SIMPSONI BREEDING IN CORAL ROCK HOLES ON THE COAST OF TANZANIA,

World Health Organization, Dar es Salaam (Tanzania). East African Aedes Research Unit. M. Trpis, W. K. Hartberg, C. Teesdale, and G. A. H. McClelland.

H. McCleiland.
Bull W H O. Vol 45, No 4, p 529-531. 1971.
Identifiers: *Aedes-aegypti, *Aedes-simpsoni, *Africa(Tanzania), Axils, Banana, Breeding, Coast, Coconut, Colocasia, Coral, Holes, Pineapple, Rock, Sheels, Snail, Tree.

Breeding sites of A. aegypti in East Africa can be generally divided into 2 groups: breeding places associated with man, i.e., indoor and outdoor breeding in artificial containers (water-pots, discarded tins, tires, bottles, barrels, buckets, glass jars, etc); and natural breeding places (tree holes, coconut shells, snail shells, sometimes plant axils, and rock holes). Wiseman et al. (1939) recorded A. aegypti breeding holes in coral on the Kenya coast near Mombasa. Since the East African coast is relatively uniform, it is probable that these holes were identical to those observed during the present study. An extensive survey of the coast would probably indicate that A. aegypti breed wherever there are elevated coral outcorps. In view of the abundance of both A. aegypti and A. simpsoni on the uninhabitad Bongoyo Island, those on Msasani peninsula should probably be regarded as relict forest populations rather than indicating any invasion of an uncharacteristic habitat. A. simpsoni is generally regarded as a species that breeds in the leaf axils of plants. The present work in Tanzania indicates that the breeding sites of A. simpsoni are pineapple axils, colocasia, certain bananas, tree holes, coral holes, and snail shells, in order of preference. A. simpsoni is also known to breed frequently in mandee containers in South Africa (Muspratt, 1965). The coral rock holes on the Msasani peninsula near Dar es Salaam, Tanzania, are considered to be the newly-recorded breeding sites of A. simpsoni.—Copyright 1973, Biological Abstracts, Inc. W74-04697

THE PHYTOPLANKTON PRODUCTIVITY IN THE PYASINA RIVER NEAR TAREYA VILLAGE (WESTERN TAIMYR), (IN RUSSIAN), Akademiya Nauk SSSR, Novosibirsk. V. I. Ernolaev. Gidrobiol Zh. Vol 8, No 6, p 97-100. 1972.

Identifiers: *Asterionella-formosa, Melosira, *Phytoplankton, *Productivity, Pyasina river, *USSR(Taimyr).

The productivity of phytoplankton in the Pyasina river near Tareya village (USSR) was studied. Samples of water were filtered through no 6 filter paper and subjected to quantitative tests of the intensity of plankton photosynthesis in phials with oxygenation modification. The quantity of algae reached 1.5 mill ki/l of water, bomass 1.017 mg/l and photosynthetic intensity 0.56 mgO2/l day. Fifty species were found of which Asterionella formosa Hass and species of Melosira were most common.—Copyright 1973, Biological Abstracts, Inc.

CHANGES IN THE AVIFAUNA OF THE BIESBOSCH IN THE IST YR AFTER THE ELIMINATION OF THE TIDE,

D. Fey, and T. Lebret. Limosa. Vol 45, No 3/4, p 101-118. 1972. Illus.

(English summary).
Identifiers: *Avi fauna, Bluethroat, Breeding, Coot, Crested, Cyanosylvia-suecica, Fulica-atra, Grebe, *Netherlands(Biesbosch), Panurus-biarmicus, Platalea-leucoradia, Podiceps-cristatus, Reeds, Sluices, Spoonbill, Teal, *Tideal mud flats.

Until Nov. 1970 the Biesbosch, Netherlands, was a freshwater tidal delta area. The Rhine and Meuse rivers meet here. The area is 32 km southeast of Rotterdam. The tidal amplitude was some 2 m. In Nov., 1970 a system of sluices was put into action, and the tidal span was reduced to 0.20 m. The high level of the new situation is 0.60 m below the original high tide level. Some 65-75% of the former tidal mud flat is permanently water covered now. Changes in the vegetation and in numbers of bird species are described. Teal (Anas crecca) numbered 10,000-15,000 birds in former days. Their numbers were greatly reduced after elimination of the tide. The great crested grebe (Podiceps cristatus) has started to breed. Spoon-bills (Platlael aleucorodia) are present in considerable numbers. Coots (Fulica atra) increased as breeding birds. They reduced the extension of the reeds, which eventually may be a positive factor. Low nestling species bluethroat (Cyanosylvia svecica) and bearded it (Panurus biarnicus) increased in the former tidal reed beds, but soon will lose their habitat because the reed beds are permanently dry and will develop into scrub.—Copyright 1973, Biological Abstracts, Inc.

SYNGNATHUS NIGROLINEATUS NIGROLINEATUS (EICHWALD) IN THE FRASINET RIVER AND MOSTISTEA LAKE, (IN RUMANIAN).

R. Giurca, and M. Olaru. Bul Cercet Piscic. Vol 31, No 1/2, p 91-93. 1972.

Illus. (English summary).
Identifiers: Frasinet, Lakes, Mostistea, Parasites,
Records, *Reproduction, River, *Romania,
Syngnathus-nigrolineatus-nigrolineatus,
*Lophobtanchiate, Fish foods.

Occurrence was noted, for the first time, in the lake Mostistea and the river Frasinet (Romania) of the lophobtanchiate S. nigrolineatus nigrolineatus. Some biometrical and general data are presented. The average length was 134 mm for males and 125 mm for females; average weight 2 g; number of eggs laid in the male's hatching purse 100; the eggs diameter 1.5-1.7 mm. Some aspects related to food and the parasites of the fish, in the environmental conditions of the respective ecosystems are discussed.—Copyright 1973, Biological Abstracts, Inc.
W74-04700

SOME NEW DATA CONCERNING ZIZANIA LATIFOLIA (GRISOB.) STAPF AND ITS

Erosion and Sedimentation—Group 2J

RESOURCES IN THE FLOOD PLAINS OF LOWER AMUR, V. S. Shaga, and N. I. Shaga. Rast Resur. Vol 8, No 1, p 122-126. 1972. Identifiers: Floodplains, *Forage plants, Medicinal properties, *USSR(Amur floodplains), *Zizania-Latifolia, *Vegetation.

An effective method for propagation by means of an elecuve method for propagation by means of shoots that develop from rhizotome buds was developed for this promising forage plant. This plant has medicinal properties.—Copyright 1973, Biological Abstracts, Inc. W74-04703

VERTICAL DISTRIBUTION OF ZOOBENTHOS OF THE MOUNTAIN RIVER OF ADZHAR ASSR (IN RUSSIAN),
Tbilisskii Gosudarstvennyi Universitet (USSR).

R. S. Zosidze.

Soobshch Akad Nauk Gruz SSR. 68(2): p 461-463,

1972, English summary.
Identifiers: *Benthos, *Distribution
Mountain rivers, *USSR(Adzhar *Distribution(Vertical), ASSR), *Zooplankton.

Investigations have shown that the qualitative and quantitative composition of zoobenthos in some mountain rivers of Adzhar, ASSR, USSR increases upstream. This is assumed to be a natural phenomenon for mountain rivers.—Copyright 1973, Biological Abstracts, Inc. W74-04818

TYPES OF DISTRIBUTION PATTERN AMONG FRESHWATER ANIMALS, (IN RUMANIAN), Academia R. S. R., Bucharest (Rumania). Institu-

tul de Biologie. P. Banarescu

Rev Roum Biol Ser Zool. 17(1): p 23-30. 1972. Identifiers: Anostraca, Crustacea, *Distribution patterns, Fish, Insects, Mites, Mollusks, *Aquatic

The main types of distribution pattern recognized among epigeous fresh-water animals are: primary aquatic animals (fishes, higher crustaceans, mollusks) whose ranges depend mainly on river drainages; inhabitants of temporary pools with restricted range (the most important group being the Anostraca) whose ranges depend on climatic zones; insects and water mites, of terrestrial origin; the range of the rheophilic ones depend mainly on mountain ranges. Many hypogeous animals, both of marine and of fresh-water origin, seem to have retained the range of colonization of subterranean waters, in spite of the old age of many of them.--Copyright 1973, Biological Abstracts Inc.

2J. Erosion and Sedimentation

GROWTH OF LONGSHORE CURRENTS DOWNSTREAM OF A SURF-ZONE BARRIER, Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.

Pr. S. Eagleson. In: Coastal Engineering Santa Barbara Specialty Conference, American Society of Civil Engineers, October 1965, Chap 20, p 487-507, 1966. 6 fig, 9 ref. DA-49-005-CIV-ENG-62-9.

Descriptors: *Sediment transport, *Beaches, Coasts, Model studies, *Currents(Water), Coasts, Model studies, *Waves(Water), Equations.

Identifiers: Longshore currents, Surf zone, Mo-

Momentum flux considerations are used to formulate a differential equation governing the growth, with distance, of the mean longshore current velocity in the surf-zone on a plane, impermeable beach due to monochromatic waves. The equation

is solved for the flow situation downstream of a surf-zone barrier and is shown to compare favorably with laboratory measurements. The asymptotic (uniform flow) form of the relation is also shown to be in good agreement with the field and laboratory data of other investigators. Conclusions are reached governing the size of laboratory sions are reacting governing the size of haboratory models necessary to represent conditions of fully developed longshore currents. A thorough un-derstanding of the mechanics of sand transporta-tion parallel to coasts must ultimately be based upon detailed knowledge of the complicated fluid motions which occur within the surf zone. This work is devoted to the formulation and evaluation of a rational analytical model for the prediction of mean longshore current velocity as a function of beach and wave parameters. (Sinha-OEIS)

MEAN DIRECTION OF WAVES AND OF WAVE

Leeds, Hill and Jewett Inc., Los Angeles, Calif.

Journal of the Waterways and Harbors Division, American Society of Civil Engineers, Vol 86, No WWI, Proceedings paper No. 2423, p 123-143, March 1960. 11 fig, 2 tab.

Descriptors: *California, *Coasts, *Beach erosion, Harbors, Waves(Water), *Coastal structures, *Beaches, Shoals, *Refraction(Water waves), Breakwaters.

Identifiers: *Shoaling, *Wave energy, Santa Bar-

Reliable predictions of erosion/accretion effects of new coastal works are necessary. A vector technique related to wave direction and duration statistics is devised, tested on Santa Barbara historical shoaling records and demonstrated as a design aid for a small craft harbor plan on a sandy reach of California coast. The configurations of sand deposits which occur as the result of wave action, or because of the interception of wave action, must be related to the direction of wave motion at the locality. Waves expend work which is applied in the direction of the motion of water particles within the waves. It is hypothesized that in mature shouls and beaches their outline will bear a distinguishable relationship to the mean direction of all wave energy which has been applied at that location. If this hypothesis is acceptable, the first need becomes a consistently reproducible definition of the beach distinctions. tion of the mean direction of wave energy at a specific location from basic data. (Sinha-OEIS)

THE RELATIONSHIP BETWEEN WAVE ACTION AND BEACH PROFILE CHARAC-TERISTICS, University Coll., London (England). Dept. of Civil

Engineering.

In: Proceedings of Seventh Conference on Coastal Engineering, The Hague, Netherlands, August 1960, ASCE, Published by Council, the Engineering Foundation, Vol 1, Chap 14, p 262-277, 1961. 5

Descriptors: *Hydraulic models, *Sediment transport, Beaches, Profiles, Particle size, *Beach ero-sion, *Waves(Water), *Shore protection, Profiles,

Identifiers: Breakers, Wave action, Beach cusps, Wave steepness, Phase difference, Shingle.

The results of a series of preliminary hydraulic model experiments carried out prior to a model study of the behavior of groynes in stabilizing beaches are described. Most of the beach materials used represented coarse sand or shingle in na-ture. The results demonstrate the fundamental importance of the 'phase-difference' in terms of wave period between the break-point and the limit of uprush, in relation to flow conditions, cusp for-mation, and the change from 'step' to 'bar' profiles. Within the limits of the experiments an expression connecting the breaker height, beach profile length, and grain diameter is developed, and its implications examined in relation to beach slope, and to the previous 'wave steepness' criterion for the change from step to bar type profiles. Observations are included on the rate of recession of a shoreline due to the onset of more severe wave conditions. (Sinha-OEIS)

LITTORAL TRANSPORT IN THE GREAT

United States Lake Survey, Detroit, Mich. L. Bajorunas.

In: Proceedings of Seventh Conference on Coastal Engineering, The Hague, Netherlands, August 1960, ASCE, Published by Council, the Engineering Foundation, Vol 1, Chap 20, p 326-341, 1961. 12 fig, 1 tab, 8 ref.

Descriptors: *Littoral drift, *Sediment transport, Great Lakes, *Waves(Water), *Beach erosion, Equations, *Currents(Water), Lakes. Identifiers: Wave energy, Littoral processes.

Littoral transport has been defined as the movement of material along the shore in the littoral zone by waves and currents. The material thus transported is referred to as the littoral drift. The littoral drift originates from the beach material being picked up by the water and transported along the shore and deposited in another location. Shore erosion, littoral transport, and deposition of drift are all factors in the littoral process. An analysis is presented of the littoral transport in the Great Lakes. A derivation of the transport equation and observational data on specific localities also are presented. Wave energy is the prime factor of lit-toral transport. The general circulatory currents and the currents resulting from water level disturbances do not significantly change the picture of the energy in the littoral zone of the Great Lakes. These currents might be a factor in some isolated or restricted areas. (Sinha-OEIS) W74-04334

WAVE EFFECT ON THE COAST FORMATION AND EROSION,

Construction Engineering Inst., Warsaw (Poland).

In Proceedings of Seventh Conference on Coastal Engineering, The Hague, Netherlands, August 1960, ASCE, Published by Council, the Engineer-ing Foundation, Vol 1, Chap 12, p 203-210, 1961. 6

Descriptors: Suspended load, Bottom sediment, Littoral, Coasts, *Beach erosion, Deposi-tion(Sediments), *Waves(Water), *Tidal effects, Descriptors: Suspended load, Bottom sediment, Littoral, Coasts, *Beach erosion, Deposi-tion(Sediments), *Waves(Water), *Tidal effects, Currents(Water), Measurement, *Shallow water, Instrumentation, *Sediment transport. Identifiers: Nearshore, *Wind waves, Wave ac-

Findings are summarized on the kind of sediment moved by waves, the effect of water depth on that movement, and factors of wave action in erosion and accretion of the coast. Information is given on instruments used in field and laboratory studies of sediments and their measurement. (Sinha-OEIS)

THEORETICAL FORMS OF SHORELINES Riikswaterstaat-Deltadienst, Hague letherlands). Coastal Research Dept. (Netherlar W. Griim.

In: Proceedings of Seventh Conference on Coastal Engineering, The Hague, Netherlands, August 1960, ASCE, Published by Council, the Engineering Foundation, Vol 1, Chap 11, p 197-202, 1961. 5 fig, 3 ref.

Descriptors: *Shores, *Waves(Water), Equations *Littoral, *Sediment transport. Coasts, Rivers, ns. Mathematics, *Shores, Co

Group 2J—Erosion and Sedimentation

Identifiers: *Shorelines, Littoral transport.

The mathematical treatment of factors involved in littoral processes is discussed. Conditions are idealized as littoral transport by waves only, unvarying wave characteristics, and a simple relation between the angle of wave approach and the littoral transport. Also important is the consideration of the quantity of material transported by the river to the sea. (Sinha-OEIS) W74-04336

MECHANICAL BYPASSING OF LITTORAL DRIFT AT INLETS,
Corps of Engineers, Washington, D.C. Beach Ero-

sion Roard

For primary bibliographic entry see Field 2L. W74-04337

SEDIMENT MOVEMENT AT INDIAN PORTS, Birla Inst. of Tech., Ranchi (India). Dept. of Civil Engineering. primary bibliographic entry see Field 2L. W74-04345

POSTGLACIAL PERMAFROST FEATURES IN EASTERN CANADA, Laval Univ., Quebec.

For primary bibliographic entry see Field 2C. W74-04358

THE OCCURRENCE AND CHARACTERISTICS OF NEARSHORE PERMAFROST, NORTHERN ALASKA.

For primary bibliographic entry see Field 2C. W74-04359

STRATIGRAPHY AND DIAGENESIS PERENNIALLY FROZEN SEDIMENTS IN THE BARROW, ALASKA, REGION,

Cold Regions Research and Engineering Lab., Hanover, N.H. For primary bibliographic entry see Field 2C.

RATES OF MASS WASTING IN THE RUBY RANGE, YUKON TERRITORY,

Portland State Univ., Oreg.

W74-04365

L. W. Price. In: International Conference on Permafrost, Yakutsk, USSR, 1973. p 235-245, 1973. 9 fig, 3 tab,

Descriptors: *Mass wasting, *Solifluction, *Erosion rates, *Degradation(Slope), Permafrost, Arctic, *Canada, Soil erosion, Slopes. Identifiers: *Ruby Mountains(Canada).

Measurements of mass wasting were carried out during the summers of 1967, 1968 and 1972 in the Ruby Range, Yukon Territory, Canada. The rates of mass wasting in the Ruby Range are in general 1-3 cm per yr less than those recorded for other solifluctional areas. The lower rates in the Ruby Range may be partially due to the fact that many of the measurements were made on large solifluctional terraces with a complete vegetation cover, whereas many of the measurements from other areas were made on individual lobes. (See also W74-04346) (knapp-USGS) W74-04371

DYNAMICS AND MORPHOLOGY OF SEA

National Science Foundation, Washington, D.C. Special Foreign Currency Science Information

Available from NTIS as TT-68-50355, for \$6.00 Available from N 115 as 11-08-30353, for 36-059 paper copy, \$1.45 microfiche. TT-68-50355 1969. 371 p. Translation of Dinamika i Mopfologiya Morskikh Beregov, Trudy Instituta Okeandlogii, Akademii Nauk SSR, Vol 48, 1961. Descriptors: *Sedimentation, Geomorphology, history, *Waves(Water), Geologic history, *Waves(Water), *Currents(Water), Reviews, *Beach erosion, Sand spits, *Sand bars, *Lagoons, *Bays, Translations. Identifiers: Books, Eustacy, Marine transgres-

The dynamics and morphology of sea coasts is the subject of this collection of sixteen papers. Titles included are: Some Results of Regional Coastal Investigations in the USSR; History of the Formation of the Coasts of Kara-Bogaz-Gol: Develoption of the Coasts of Kara-Bogaz-Joi; Developmental History and Present-Day Dynamics of the Chushka Spit; Some Data on the Post-Glacial Evolution of Karkinit Bay and the Accumulation of Bottom Sediments within It; Recent Development of the Temryuk Coast on the Azov Sea; Some Data on the Post-Glacial Transgression of the Bering Sea; Certain Structural and Developmen Coastal Features in the South of the Maritime Territory; Morphology and Evolution of a Lagoon Coast on Sakhalin; The Formation and Classification of Marine-Built Terraces on Emergent Coasts; Submarine Sand Ridges as Indicators of Longshore Migration of Sediments; Certain Aspects of the Interaction between Wave Flow and a Deformable Bottom at Low Velocities; The Possiblity of Forecasting Transient Coastal Relief Changes by Waves; The Determination of Maximum Wave Velocities in the Shore Zone of the Sea; The Effect of Wave Refraction on the Forma-Sea; Interface of Table 19 Submarine Coastal Slope; The Possibility of Predicting Longshore Currents in Tideless Seas; and The Role of Eolian Processes in the Dynamics of a Shallow Accumulation Coast. (See W74-04426 thru W74-04440) (Sinha - OEIS) W74-04425

SOME RESULTS OF REGIONAL COASTAL IN-VESTIGATIONS IN THE USSR, A. S. Ionin, P. A. Kaplin, and V. S. Medvedev.

A. S. Jonin, F. A. Kapini, and V. S. Medvedev. In: Dynamics and Morphology of Sea Coasts, TT 68-50355, p 1-34, 1969. 6 fig. 2 tab, 86 ref. Trans. from Trudy Instituta Okeanologii, Akademii Nauk SSSR, Vol 48, 1961.

Descriptors: Coasts, *Sea level, *Estuaries, *Fjords, *Bays, *Deltas, *Waves(Water), Currents(Water), Morphology, Geomorphology, Translations.
Identifiers: *USSR, Tectonics.

The coastal dynamics and morphology of Soviet seas studied on a large scale for a period of ten years. Findings are summarized on distinctive structural and developmental characteristics of the coasts of a given sea and attention is drawn to several common features appearing ubiquitously on the coasts of all the Soviet seas. Three groups of coastal types are identified: coasts formed by subaerial and tectonic processes and little altered by the sea; coasts shaped mainly by non-wave fac-tors; and coasts formed mainly by wave processes. It is suggested that on the whole, the post-Glacial custatic rise in the level of the World Ocean being super-imposed on the tectonic movements of the structures of the earth's crust, exerted a tremen dous influence on the formation of seaboard relief. leaving vivid traces on even tectonically mobile coasts. (See also W74-04425) (Sinha - OEIS) W74-04426

HISTORY OF THE FORMATION OF THE COASTS OF KARA-BOGAZ-GOL,

O. K. Leont'ev. In: Dynamics and Morphology of Sea Coasts, TT 68-50355. p 35-68, 1969. 8 fig, 27 ref. Trans. from Trudy Instituta Okeanologii, Academii Nauk SSSR, Vol 48, 1961.

Descriptors: *Geologic history, *Gulfs, *Bays, *Deltas, Quaternary period. Gemorphology, *Sea level, Translations. Identifiers: *USSR(Caspian Sea), Tectonics.

The Kara-Bogaz-Gol is the largest inlet of the Caspian Sea. Information is presented on the history of the formation of the coasts of this large gulf. The gemorphology and geological structures vary in different parts of the basin. An analysis of the development of the Kara-Bogaz-Gol coast and especially its bay-bar, reveals the importance of the balance of bottom sediments in the evolution of coastal accumulation forms. It is concluded that tectonic movements played practically no role in the evolution of the coastline in the Quaternary. The rapid fall of the Caspian Sea, and hence also of Kara-Bogaz-Gol after 1929 led to drastic altera-tions in the coastal relief and its dynamics. At present, the outer contour of the Kara-Bogaz-Gol depression and the water edge are separated by a wide expanse of salt plain, the surface of which formed by the top salt layer emerging from under the water. The coastal forms previously produced by wave processes now are beyond the reach of waves. A strait delta is the only feature being formed at present. (See also W74-04425) (Sinha -OFIG W74-04427

DEVELOPMENTAL HISTORY AND PRESENT-DAY DYNAMICS OF THE CHUSHKA SPIT. V. L. Boldyrev.

No. Dodyives and Morphology of Sea Coasts, TT 68-50355. p 69-91, 1969. 5 fig. 33 ref. Trans. from Trudy Instituta Okeanologii, Akademii Nauk SSSR, Vol 48, 1961.

Descriptors: *Sediment transport, *Sand spits, Geologic history, *Bottom sediments, Bays, Coasts, *Winds, Translations.
Identifiers: Kerch Strait, *USSR(Chushka Spit), *Nearshore, Azov Sea.

The Chushka Spit situated in the north of the Kerch Strait is the only active coastal accumula-tion form in this area. It is 17.5 km long, and its width at the site of attachment to the bedrock coast is only 40-60 m. The spit has been developing for at least 2,500 years. During its main formation period the spit received its material from the adjacent stretch of bedrock coast undergoing vigorous abrasion, as well as from the bottom of the strait and from the south of the Azov Sea. In the comparatively Recent past, a drastic change again occurred in the trend of the coastal processes on Chushka, due to the change in its supply. The gradual straightening of the arc of Temryuk Bay by abrasion and accumulation and by the bay then filling with sediments deposited by by the bay then filling with sediments deposited by the Kuban River, again made possible the considerable influx of sandy sediments from the bay to Chushka spit. This was facilitated by the dominant northeasterly winds, which have the largest force and duration and the highest incidence frequency. Certain signs, including the distribution of bottom sediments in the spit area, indicate progressive influx of sand to the spit also at the present time. (See also W74-04425) (Sinha - OEIS) W74-04428

SOME DATA ON THE POST-GLACIAL EVOLU-TION OF KARKINIT BAY AND THE ACCUMU-LATION OF BOTTOM SEDIMENTS WITHIN

IT, E. N. Nevesskii. In: Dynamics and Morphology of Sea Coasts, TT 68-50355. p 92-110, 1969. 5 fig, 10 ref. Trans. from Trudy Instituta Okeanologii, Vol 48, 1961.

Descriptors: *Deposition(Sediments), *Sedimentation, *Erosion, Bays, Coasts, *Bottom sediments, *Shores, Translations.
Identifiers: Black Sea, *USSR(Karkinit Bay), Lobate coasts.

Karkinit Bay is the largest in the Black Sea. The bay outlines are very unusual. The abundance of sandy material gave rise to large accumulation coastal forms, causing heavy articulation of the coastline. These conditions resulted in a typical

Erosion and Sedimentation—Group 2J

lobate coast, which does not occur anywhere else on the Black Sea. A characteristic feature of the bottom relief in the bay is the extensive occurrence of transverse ridges mostly composed of sandy-shelly material, sometimes blanketed by sandy-silty sediments. The easternmost ridge is known as Churyumskaya bank. West of the bank lies the most distinct rise, which is the Bakalskaya bank. These are followed by two less distinct ridges, stretching from the shores of Tarkhankut Peninsula in the northwest to the opposite coast of the bay. Coastal accumulation forms, owing their sediment supply to coastal abrasion, pass through multiphase development during nonuniform transgression of the sea. They may 'die' and become restored, with a certain spatial shift depending upon the transgression rate and correspondingly upon abrasion rate for stretches of bedrock coast. Significant alterations in the coastal contour due to prolonged development of large coastal stretches may bring about final 'death' of coastal accumulation forms of a certain type, thus completing their multiphase developmental cycle. Simultaneously, the same change of coastal contour may produce conditions for the formation of other accumulation bodies, not uncommonly of other types on other coastal areas. On continuation of the nonuniform transgression, they likewise undergo multiphase development and may then disappear, having completed their cycle. (See also W74-04425) (Sinha - OEIS) W74-04429

RECENT DEVELOPMENT OF THE TEMRYUK COAST ON THE AZOV SEA,

Yu. A. Pavlidis.

In: Dynamics and Morphology of Sea Coasts, TT 68-50335. p 111-123, 1969. 4 fig. 8 ref. Trans. from Trudy Instituta Okeanologii, Akademii Nauk SSR, Vol 48, 1961.

Descriptors: Coasts, *Sand spits, *Bottom sediments, *Bays, Sands, *Sedimentation, *Erosion, Geologic history, Translations. Identifiers: *USSR(Azov Sea), Temryuk Coast, Nearshore processes, Kuban River.

Investigations covered the nearshore zone in the south of Temryuk Bay from Cape Akhilleon in the west to Verbyanaya spit in the east. In plan, this area is a shallow concave arc complicated by the wave-cut Akhilleon-Pekly prominence on the one side and by the protuding delta of the Kuban River on the other side. The present-day quantity of sand along the Temryuk coast is considerably larger than it was in the Recent past. The 1954 survey of bottom sediments performed by staff members of the Black Sea Experimental Research Station of the Institute of Oceanology of the Academy of Sciences of the USSR and the data obtained with a vibrating piston corer in 1958 show that at the present time sand forms a continuous belt on the nearshore bottom. The sand descends downslope to depths of 7 m, having an average thickness of some 1.5m in the Kuchugury-Golubit-skaya area. The sand belt becomes somewhat wider opposite Peresyp, possibly due to the transport of sandy material through the Peresyp Strait. The thickness of sandy sediments is considerably larger on the east of the Kuban delta than on the west. (See also W74-04425) (Sinha - OEIS) W74-04430

SOME DATA ON THE POST-GLACIAL TRANS-GRESSION OF THE BERING SEA,

F. A. Shcherbakov. In: Dynamics and Morphology of Sea Coasts, TT 68-50355. p 124-131, 1969. 4 fig, 11 ref. Trans. from Trudy Instituta Okeanologii Akademiya Nauk SSSR. Vol 48, 1961.

Descriptors: *Geologic history, *Sea level, *Sedimentation, *Erosion, *Deposition(Sediments), Costs, Translations. Identifiers: Eustacy, Post glacial transgression, *Bering Sea, Black Sea.

Findings are compared with data on Recent past-Glacial transgression of the Black Sea. A com-parison of data for the Black and the Bering Seas suggests that in both cases certain structural features of the submarine coastal slope occur at depths of 10 m. These features are apparently re-lated to common causes, namely to the intermit-tent custatic fluctuations of sea level during the post-Glacial transgression of the World Ocean. The question arises as to whether a relationship exists between the rate of sea level and that of the coastal processes. When the submarine relics of coastal accumulation forms in the Bering Sea were discussed., it was pointed out that their formation was related to a certain slowing down of transgres-sion or even to a stabilization of sea level. However, it was most probably not a complete sta-bilization, but just a decrease in the rate of rise in sea level, when the latter reached a certain measure of equilibrium with the rate of coastal processes. The relationship between the rate and duration of changes in sea level on the one hand and the intensity of the effect of the coast-forming processes on the seaboard, on the other hand, is very important for reconstructing the history of coastal development. (See also W74-04425) (Sinha OFIS W74-04431

CERTAIN STRUCTURAL AND DEVELOPMENTAL COASTAL FEATURES IN THE SOUTH OF THE MARITIME TERRITORY.

V. S. Medvedev, Y. S. Dolo Shcherbakov.

Sheliebakov. In: Dynamics and Morphology of Sea Coasts, TT-68-50355. p 132-156, 1969. 11 fig, 38 ref. Trans. from Trudy Instituta Okeanologii Akademiya Nauk SSSR. Vol48, 1961.

Descriptors: Geologic history, Coasts, *Bays, *Inlets(Waterways), Geomorphology, *Sedimentation, *Alluvium, Translations. Identifiers: Geologic structures, Coastal uplift, USSR, Maritime Territory.

The coastline of the southern Maritime Territory west of Cape Povorotnyi and farther south to the boundary with North Korea is some 500 km long. The most characteristic feature of this seaboard is the complex indentation of its coastline. The coast is indented by numerous bays and inlets over its entire length, the Amur and Ussuri bays penetrating 50-70 km into the land. Other large bays are America, Voltok, Strelok, Slavyanskii, Poseta, etc. Such a complex coastal indentation is closely related to the geological structure of the region and depends primarily upon the strike and the comdepends primarily upon the strike and the com-bination of the major geological structures. The coasts of the southern Maritime Territory are com-paratively young geomorphologically. Analysis of the coastal relief shows that the dominant role in the supply of accumulation forms and the straightening of the complex articulated contour has been played by alluvium throughout all the stages of its evolution as an embayed coast. The influx of sediments from the bottom became possible only after the submarine slope gradients were reduced again by alluvium. The importance of alluvium increased still further in the course of the Recent coastal uplift. The few forms which were largely dependent on abrasion debris for their supply have developed under the conditions of sediment deficit, undergoing reconstruction and washout. Alluvium is apparently the dominant facin coastal zone dynamics not only of southern Maritime Territory, but generally of em-bayed ingression coasts composed of rocks of fairly high resistance to abrasion and in the early stages of their geomorphological development. (See also W74-04425) (Sinha - OEIS) W74-04432

MORPHOLOGY AND EVOLUTION OF ALAGOON COAST ON SAKHALIN, A. T. Vladimirov.

In: Dynamics and Morphology of Sea Coasts, TT 68-50355. p 157-185, 1969. 8 fig. 1 tab, 13 ref. Trans. from Trudy Instituta Okeanologii, Akademii Nauk SSSR Vol 148, 1961.

Descriptors: Coasts, *Lagoons, Algae, *Sedimentation, *Littoral drift, Beaches, Geomorphology, *Sea level, *Shores. Identifiers: *Bay-bars, Post glacial transgression, *USSR(Sakhalin [sland).

The most characteristic structural feature of the northeastern seaboard of Sakhalin Island is the extensive development of lagoons. These lagoons stretch in a nearly continuous chain over more than 300 km. On the whole, the lagoons are shallow and in a majority of cases have a thick covering layer of algae. Morphological analysis data have established the existence of three beach drifts within the boundaries of the northeastern coastal region of Sakhalin. Data determined by investigations of the seaboards of several seas show that the straightening of the coastal contour is often the leading process in the last stages of coastal development. Depending upon the initial contour and the structure of the submarine coastal slope, accumulation forms of different genesis could arise in the first stages of development. However, further straightening of the coast and gradual merging of accumulation forms caused the majority to become polygenetic. Extensive straightening of the coastline, and development of a lagoon coast which replaced the earlier, mostly ingressive coasts were the result of a general slowing down of post-Glacial transgression followed by relative stabilization of sea level. The region of Sakhalin Island was cited by Zenkovich (1946) as a typical example of the deat demonstrated the very complex nature of the coastal development under actual specific conditions, and likewise confirmed the proposed schemes. (See also W74-04425) (Sinha-OEIS)

SUBMARINE SAND RIDGES AS INDICATORS OF LONGSHORE MIGRATION OF SEDI-MENTS,

V. L. Boldvrev.

V. L. Boluyire. In: Dynamics and Morphology of Sea Coasts, TT 68-50355. p 207-217, 1969. 2 fig, 25 ref. Trans. from Trudy Instituta Okeanologii, Akademii Nauk SSSR, Vol 48, 1961.

Descriptors: *Sand waves, *Littoral drift, *Sediment transport, *Waves(Water), Sand bars, Translations.
Identifiers: *Submarine sand ridges, Black Sea,

Azov Sea, Baltic Sea.

Field observations on the coasts of the Black, the Azov, and the Baltic seas and analysis of air photographs for different coastal stretches demonstrated that the relative number and arrangement of submarine ridges, as well as the granulometric distribution of sediments in the ridge zone, are directly related to variations in the principal parameters of beach drifts and the total reserves of unconsolidated debris on the bottom. Variations in the morphology and dynamics of submarine ridges are usually closely related to variations in the principal parameters in the beach drift, viz., its transporting capacity and competence. A decrease in the number of ridges or their total disappearance in the path of the beach drift indicates a considerable variation of the hydrodynamic regime. The presence of even a single ridge in the path of the beach drift indicates transit of sediments in the area, providing steady supply for the ridge. The appearance of single or several ridges in the path of obviously undersaturated beach drift in certain coastal areas indicates a drop in competence and partial accumulation of sediments on the bottom. An increase in the number of sub-marine ridges in the path of the beach drift likewise indicates increased carrying power or

Group 2J—Erosion and Sedimentation

decreased competence. The presence of coarse-grained sediments and coarse debris in the troughs between the ridges, as well as bottom areas which have no sediments, indicates undersaturation of beach drift. The echelon arrangement of ridges indicates that they are being formed by waves and not by currents, although the latter introduce certain modifications in the ridge morphology, e.g., they may facilitate the overdeepening of troughs and hence a more pronounced ridge relief. (See also W74-04425) (Sinha - OEIS)

CERTAIN ASPECTS OF THE INTERACTION BETWEEN WAVE FLOW AND A DEFORMABLE BOTTOM AT LOW VELOCITIES,

B. A. Shuyak.

B. A. Shuyak.

In: Dynamics and Morphology of Sea Coasts,

TT68-50355. p 218-283, 1969. 12 fig, 6 tab, 30 ref.

Trudy Instituta Okeanologii, Trans. from Trudy Instituta Akademii Nauk SSSR, Vol 48, 1961.

soils, Wind, ater), Flow, Descriptors: *Ripples, Aeolian soils, Wi Coastal structures, *Waves(Water), Flo *Sedimentary structures, Hydraulic structures. Identifiers: Black Sea, Bottom topography

Results are presented of studies of periodic structures of wave flow, including the conditions and mechanism of the formation of periodic wave structures; dependence of their parameters upon those of wave flow, liquid and particle constants; dependence of the symmetry of structures upon that of flows; and classification of wave, channel, and eolian periodic forms. Also discussed are transverse periodicity of ripples; the barrier effect; dependence of the velocity of ripples and particle flow upon wave parameters; kinematics of periodically deformed bottom; and, finally, the application of artificial periodic structures of the wave flow to the protection of hydraulic structures against burial by sediments. (See also W74-04425) W74-04435

THE POSSIBILITY OF FORECASTING TRANSIENT COASTAL RELIEF CHANGES BY

WAVES, V. V. Longinov.

In: Dynamics and Morphology of Sea Coasts, TT68-50355. p 284-306, 1969. 1 fig, 13 ref. Trans from Trudy Instituta Okeanologii, AkademiiNauk SSSR, Vol 48, 1961.

Descriptors: *Waves(Water), Coasts, *Profiles, *Slopes, *Tides, *Sediment transport, Translations

Identifiers: *Wind waves.

Section I deals with the factors controlling the changes of the coastal zone relief and the mechanism of such changes. Section II provides a classification of the profile types found in the coastal zone, based on their hydrodynamic fea-tures and their relation to the dynamics of relief and sediments established in Section I. Section III provides certain principles for forecasting coastal zone relief dynamics, or at least the alterations in its profile. The profile dynamics of the submarine coastal slope is considered mainly as a two-dimensional problem. Under natural conditions the movement of the water and sediments in the coastal zone occurs mainly simultaneously along the profile and along the shoreline. Eventually, it will only be possible to understand the changes occurring in this zone and to forecast them correctly by dealing with the relief dynamics in the coastal zone as a three-dimensional problem. A classification of profiles consists of the following: profiles with pebble beaches, 'rugged' for a great majority of waves; sandy profiles with large gradients; sandy profiles with small gradients; the extremely shallow sandy profiles; and finally, the coastal zone relief that faithfully follows the bedrock relief, although the latter may be covered by a sediment blanket. Relief dynamics in the coastal zone are thus organized for further detailed study. (See also W74-04425) (Sinha - OEIS) W74-04436

THE DETERMINATION OF MAXIMUM WAVE VELOCITIES IN THE SHORE ZONE OF THE

SEA, V. V. Longinov.

N. V. Longmov.
In: Dynamics and Morphology of Sea Coasts,
TT68-50355. p 307-329, 1969. 3 fig, 6 tab, 13 ref.
Trans from Trudy Instituta Okeanologii, Akademii
Nauk SSSR, Vol 48, 1961.

Descriptors: Coasts, *Shores, *Waves(Water), *Slopes, Profiles, Measurement, *Pressure, *Shallow water, Translations.

Identifiers: Nearshore processes, *Wave velocity, Wave pressure.

The solution of many practical problems requires the determination of the maximum wave velocities in a certain horizon of the water column in the shore zone seawards of the wave dissipation zone for given parameters of the deepwater waves and a certain submarine coastal slope relief. The method proposed for determining wave velocities in the shore zone is based on data elicited by field measurements of wave velocity pressures with VDK devices, most of which have already been published (Longinov, 1958). A few empirical equations and coefficients are provided for determining more accurately undulatory movements of water in the shore zone based on additional observations and certain new phenomena discovered by recent measurements. An attempt was made to transfer readings of the VDK device to real velocities, but the reliability of this transition was far from established. The first section of this paper deals with the substantiation and more accurate descrip-tion of this transition. Section II provides a method for calculating the asymmetry of pressures, based on observations. Section III provides the correction factors for transition from the mean values of observed pressures to values with a reliability of 5 and 1%. In Sections IV and V the results of measurements of the frontal and the vertical wave pressure components are given. Section VI offers certain experimental data on normal pressure variations according to the horizon in which the measurement device was installed. (See also W74-04425) (Sinha - OEIS) W74-04437

THE EFFECT OF WAVE REFRACTION ON THE FORMATION OF AN EQUILIBRIUM PROFILE OF SUBMARINE COASTAL SLOPE, B. A. Popov.

In: Dynamics and Morphology of Sea Coasts, TT68-50355. p 330-349, 1969. 5 fig, 11 ref. Trans from Trudy Instituta Okeanologii, Akadomii Nauk SSSR, Vol 48, 1961.

Descriptors: *Shores, *Refraction(Water waves), Waves(Water), Coasts, Profiles, *Slopes, Trans-

Identifiers: Wave action, *Equilibrium profile

Refraction of waves is among the main factors controlling the formation of an equilibrium profile of the submarine slope. It enhances the natural trend of the process. A profile of any shape cannot reverse its curvature without the interference of additional factors. Under the influence of refraction, a convex slope must inevitably develop as abrasional, while a concave slope must develop as a accumulative. A planar smooth submarine slope may develop different equilibrium profiles, depending upon its gradient, being in the main an accumulation profile in the case of small initial gradients and an abrasion profile in the case of fairly large gradients. An abrasion equilibrium profile may be formed in principle in certain cases where there is a small initial bottom gradient, although at first glance this conclusion contradicts the established ideas. Investigations of wave interaction with slopes undergoing washout in wave tanks exclude the effect of refraction. In this manner the process is distorted and much care is needed to interpret the results. It is preferable that such investigations be performed on spatial shore models in wave basins. (See also W74-04425)

THE OF PREDICTING POSSIBILITY LONGSHORE CURRENTS IN TIDELESS SEAS.

In: Dynamics and Morphology of Sea Coasts, TT68-50355, p 350-364, 1969. 2 fig, 1 tab, 14 ref. Trans from Trudy Instituta Okeanologii, Akademii Nauk SSSR, Vol 48, 1961.

Descriptors: Coasts, *Shores, *Waves(Water), *Circulation, *Shallow water, Translations.
Identifiers: Nearshore, *Wave energy,
*Longshore currents, Shoaling, Breaking waves, Identifiers: Wave theory.

The principal process in water dynamics in the shore zone is the transformation of wave energy which on the whole determines also the character of water circulation in the vicinity of the shore. Calculations of the velocities of longshore currents are therefore based on the transformation of wave energy in the transformation of the shoaling waves from purely oscillatory into translatory motion of the entire agitated water column. Complexity of the process prevented the elaboration of a strict theory which would describe the actual shoaling waves from the beginning of deformation to the moment of breaking with the necessary degree of accuracy Therefore, when considering the factors generating currents in the shore zone, that wave theory is chosen which offers the best agreement with the actual waves observed in the shallow area under investigation. (See also W74-04425) (Sinha - OEIS) W74-04439

THE ROLE OF EOLIAN PROCESSES IN THE DYNAMICS OF A SHALLOW ACCUMULA-TION COAST.

N. A. Aibulatov.

In: Dynamics and Morphology of Sea Coasts, TT68-50355. Vol 48 p 365-371, 1969. 3 fig. 8 ref. Trans from Trudy Instituta Okeanologii, Akademii Nauk SSSR, Vol 68, 1961.

Descriptors: Aeolian soils, *Sediment transport, *Dunes, *Wind erosion, *Beaches, Profiles, Coasts, Translations. Identifiers: *Aeolin sands, Black Sea, *Wind transport

In investigations of the dynamics of sandy marine deposits it was necessary to study eolian processes, since it was impossible not to take their effects into account in the coastal zone. For instance, the following vivid instance of the burying effect of eolian deposits in one of the ports was observed. Strong continental winds (up to 20 m/sec) formed a sandy beach some 5 m wide at the almost sheer port wall in five days. Investigations were carried out in an area of the Anapa bay-bar in the Black Sea. Even under the specific conditions of Anapa bay-bar, the volumes of wind-transported sand demonstrated the importance of wind-sand stream in the dynamics of as to the degree of capitalization and the extent to which it can be measured. (Hoffman-North Carolina) W74-04440

A LABORATORY INVESTIGATION OF FREE

SURFACE FLOWS OVER WAVY BEDS, Iowa Univ., Iowa City. Inst. of Hydraulic Research. For primary bibliographic entry see Field 8B.

W74-04477

Erosion and Sedimentation—Group 2J

MUDFLOWS (SELEVYYE POTOKI), Akademiya Nauk SSSR, Moscow. Institut Vod-nykh Problem.

or primary bibliographic entry see Field 4D. W74-04581

SLOPE DEVELOPMENT ON A MISSISSIPPI RIVER BLUFF IN HISTORIC TIME, King's Coll., London (England). Dept. of Geog-

raphy.
D. Brunsden, and R. H. Kesel. Journal of Geology, Vol 81, No 5, p 576-598, September 1973, 15 fig. 3 tab. 27 ref.

Descriptors: *Degradation(Slope), *Slopes, *Geomorphology, *Bank erosion, Topography, Terrain analysis, Erosion, *Mississippi River, Alluvian, Alluvial channels, *Louisiana.

Hillslope development was examined along a seg-ment of the Mississippi River bluff at Port Hudson, Louisiana. The entire bluff segment was being undercut by a meander of the Mississippi River in 1722. Since that time, the meander has migrated downstream progressively, abandoning the river bluff. A space-time calibration of the hill-slopes along the bluff was made by determining the position of the river along the bluff base from historic maps and aerial photographs. In plan, the bluff was divided into three segments: high, intermediate, and low intensity according to processes acting along the base of the bluff. The high-intensity zone represents a zone of active undercutting by the river, the intermediate zone is characterized by basal scour, and the low-intensity zone by basal aggradation. The present rate of retreat for each segment was calculated to be 75, 1.0, and 0.63 ft/year, respectively. The slope profiles within the three zones represent a sequential change reflect-ing the change in basal conditions. Hillslopes grade ing the change in basal conditions. Histopes grade from the high-intensity zone, where profiles have a mean slope angle of 44 deg and a well developed cliff face, to the concave profiles of the low-inten-sity zone. The latter profiles lack the cliff face and have a mean slope angle of 19.5 deg. Slope profiles in each of the zones reach a steady-state condition. It is estimated that a steady-state condition for slopes subjected to subaerial processes can be achieved in slightly more than 90 years. (Knapp-USGS) W74-04585

THE EFFECT OF COLLECTING TIME AND GRAIN SIZE ON THE SAMPLING OF STREAM SEDIMENTS FOR GEOCHEMICAL MAPPING IN THE ST. CATHARINES AREA, ONTARIO, Brock Univ., St. Catharines (Ontario). Dept. of Geological Sciences.

F. Gawron.

Available from Brock University, Dept. Geological Sciences, St. Catharines, Ontario, Canada, Price \$2.00. Research Report Series, No. G, Studies in Landscape Geochemistry, No 3, February 1973. 45 p, 9 fig, 2 tab, 9 ref. Canada Geol. Survey Grant 11-70 NRC Grant A 7715.

Descriptors: *Sampling, *Particle size, *Waste quality, *Sediments, *Water pollution, *Canada, Geochemistry, Mapping.
Identifiers: St. Catharines(Ontario).

Factors that influence the variation of chemical data were studied in the Twelve Mile Creek drainage basin of St. Catharines, Ontario. Time of sampling in an industrial and urbanized area is of more importance than in the rural areas. Samples should be collected at specific intervals of time to obtain representative data. During the course of this study, man's influence on the rural scene is at a minimum in the fall and the time of collection did not matter as much as it did in the industrial and urbanized area. To obtain comparable data in a time study or a site study, the sample material should be as similar as possible. For example, a clay sediment contains a higher concentration of trace elements than a sand sediment from the same

site. In a time study, the variation of data due to the change in sediment material could be greater than the variation due to time depending on the location. Site inhomogeneity does not affect the variance of chemical data. (Knapp-USGS)

A NUMERICAL CLASSIFICATION OF SELECTED LANDSLIDES OF THE DEBRIS SLIDE-AVALANCHE-FLOW TYPE, Macquarie Univ., North Ryde (Australia). School

of Earth Sciences.

Engineering Geology, Vol 7, No 2, p 99-114, October 1973. 2 fig, 7 tab, 26 ref.

*Landslides, *Classification, Descriptors: *Computer programs, Geomorphology, Mass wasting, *Debris avalanches, Mudflows.

A sample of 92 landslides from the greywacke hill country of the North Island of New Zealand was classified using a computer program, on the basis of 19 numerical and 43 disordered multistate attributes. The results of the agglomerative polythetic classifications do not help to distinguish these landslide phenomena clearly. Furthermore, the formation of individual groups within the computer classifications is dependent upon a wide variety of landslide characteristics. The groups, once formed, frequently bear no resemblance to landslide categories defined in more traditional classifications. Although landslide location on the hillslope proved a useful criterion in the second computer classification, because some other local landslide characteristics are partly controlled by distance from the base of the hill, this attribute is hardly likely to provide the basis of a universally applicable classification. As no one of these classifications of landslides provides any rational basis for comparison of slope failures from area to area, until a realistic scheme is forthcoming it seems sensible to rely on a simple division of landslides according to the nature of the dominant movement. However, the three basic types of failurerotation, translation, and flowage—must be supplemented by a transitional fourth type, that dominated both by flow and by translational failure. (Knapp-USGS) W74-04591

PALEOHYDROLOGY AND SEDIMENTOLOGY OF LAKE MISSOULA FLOODING IN EASTERN

WASHINGTON, Texas Univ., Austin. Dept. of Geological For primary bibliographic entry see Field 2E. W74-04599 Sciences.

STUDY OF BEACH WIDENING BY THE PERCHED BEACH CONCEPT, SANTA MONICA BAY, CALIFORNIA, Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 8B.

W74_04603

A STUDY ON MASS TRANSPORT IN BOUNDA-RY LAYERS IN STANDING WAVES, Kyota Univ. (Japan). Disasters Prevention Research Inst.

H. Noda. In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968. American Society of Civil Engineers, Vol 1, Part 1, Chap 15, p 227-247, 1969. 9 fig, 9 ref.

Descriptors: *Waves(Water), *Shallow water, Flow, Boundary layers, *Sediment transport, Harbors, Coasts, Convection.
Identifiers: *Standing waves, *Mass transport,

Japan, Shoaling.

Mass transport in the boundary layers developed on smooth and horizontal bottoms by standing waves in shallow water is discussed. In a theoretical approach, the basic equations of laminar boun-dary layers are applied to solving the oscillatory motion in the boundary layers caused by the standing waves. The mass transport velocities are derived on the basis of solutions of the second approximation which describe the flow velocity near the bottom, and the effects of convective terms involved in the basic equations are investigated. Experimental measurements in standing waves of mass transport velocity in the bottom boundary layer were carried out using dye-streak and solidparticle methods. The experimental data are compared with the theoretical prediction. (Sinha-OFIS)

APPLICATION OF FLUORESCENT COATED SAND IN LITTORAL DRIFT AND INLET STU-

Florida Univ., Gainesville. Dept. of Coastal and Oceanographic Engineering. For primary bibliographic entry see Field 2L. W74-04616

QUANTITATIVE TRACING OF LITTORAL

DRIFT, Norges Tekniske Hoegskole, Trondlheim. Dept. of Harbour Engineering. P Rrunn

In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968. American Society of Civil Engineers, Vol 1, Part 2, Chap 20, p 322-328, 1969. 5 fig.

Descriptors: *Littoral drift, *Bed load, *Sediment transport, Tracers, Fluroescent dyes, *Florida. Identifiers: *Tidal currents, *Longshore transport, Bottom creep.

Tests were run at Fernadina Beach, Florida, using fluorescent tracers and bed load traps with automatic doors and hydraulic lift to determine the thickness of the bed load transport layer on the bottom ('bottom creep'). Longshore transport as bed load seems to increase with longshore wave energy. The importance of a longshore (tidal) current superimposed on the wave-energy current was noted for the low-energy section. The importance of the longshore current is also evident from the trough transports predominance over bar transport for the energy levels under considera-tion. This is undoubtedly going to change for higher inputs of wave energy accompanied by frequent wave breaking and stir-up activity on the bar. The results are of preliminary and indicative nature only. (Sinha - OEIS) W74-04617

VARIABLE DISPERSION AND ITS EFFECTS ON THE MOVEMENTS OF TRACERS ON BEACHES,

Research Station, Wallingford (England)

W. A. Price. In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, Sep-tember 1968. American Society of Civil Engineers, Vol 1, Part 2, Chap 21, p. 329-334, 1969. 4 fig., 1 ref.

Descriptors: *Tracers, *Sediment transport, *Beaches, Model studies, *Tidal effects, Dispersion, *Shallow water, Coasts, Littoral drift Identifiers: Arithmetical models. Centroid

To arrive at a quantitative assessment of sediment transport using tracers it is usual to analyse the results using 'centroid method'. It is satisfactory to apply such a method when the dispersion from any cause is constant over the area under study. However, when tracers are used in a variable dispersive field, as on a beach, the interpretation

Field 2-WATER CYCLE

Group 2J—Erosion and Sedimentation

of the results by normal methods can give misleading results. A simple arithmetical model is used to demonstrate that it could be misleading to interpret the movements of tracers injected into a variable dispersive field, on and near a beach, by the normal methods. If, however, the present arithmetical model could be made to work quantitatively (that is values could be ascribed to the dispersion coefficients at all points on the bed) then tracer distributions measured in nature could he corrected for the apparent mass transport efin the onshore/offshore direction so that lateral distributions of tracer could then be used to (Sinha - OEIS)

A FIELD INVESTIGATION OF SAND TRANS-

PORT IN THE SURF ZONE, Florida Univ., Gainesville. Dept. of Coastal and Oceanographic Engineering.

E. B. Thornton. In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, Sep-tember 1968, American Society of Civil Engineers, Vol 1, Part 2, Chap 22, p 335-351, 1969. 8 fig, 5 ref.

Descriptors: *Florida. *Beaches. *Sediment transport, Bed load, *Waves(Water). Identifiers: Fernandina Beach(FL), *Surf zone,

Water depth, Energy spectra, Kinetic energy, Potential energy

The distribution of bed-load sand transport normal to the beach has been measured in a series of field experiments conducted in the surf zone at Fernandina Beach, Florida. Simultaneous measurements were made of the waves and water particle motion at various locations in the surf zone. The energy flux of the waves was resolved into its longshore component from the measured directional and energy spectra. The bed-load transport is related to the depth of water and longshore energy flux. Insight into the mechanics of sediment transport is obtained by comparing the wave and water parti-cle motion energy spectra, which give a direct measure of the kinetic and potential energy, at various locations in the surf zone. (Sinha - OEIS) W74-04619

THE EFFECT OF WAVES ON THE PROFILE OF A NATURAL BEACH,
Naval Postgraduate School, Monterey, Calif.
W. C. Thompson, and J. C. Harlett.

Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968. American Society of Civil Engineers, Vol 1, Part 2, Chap 23, p 352-372, 1969. 8 fig, 8 ref.

Descriptors: *Beaches, *Waves(Water), *Profiles, Descriptors.
*Sedimentation.

Identifiers: *Wave steepness, Equilibrium Identifiers:

profiles, *Hindcasts.

A 60-day study was conducted on a selected natural beach in which the beach profile was measured daily and the waves incident upon the profile were recorded continuously. Beach and wave parameters derived from the field data were empirically combined to yield: (a) quantitative relationships between the change in the profile and the average deep-water wave steepness and wave power over a lunar day (24.8) hours given the profile at the beginning of the period, (b) equilibrium profiles for different values of wave steepness, (c) an empirical relationship between wave steepness and wave power which agrees well with theory, and (d) rates at which the beach profile approached equilibrium for given initial conditions of non-equilibrium. Using the relationship developed between beach change and wave steepness, hindcasts were made of the day-to-day sand elevation at a selected location near the middle of the profile and were found to agree fairly well with the observed sand level. (Sinha - OEIS) W74-04620

COLLECTIVE MOVEMENT OF SEDIMENT IN LITTORAL ENVIRONMENT

Louisiana State Univ., Baton Rouge, Coastal Studies Inst.

C. J. Sonu. C.J. Sonu. In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, Sep-tember 1968, American Society of Civil Engineers, Vol 1, Part 2, Chap 24, p 373-400, 1969. 16 fig, 35 ref. Nonr 1575(03), NR 388-002.

Descriptors: *Sediment transport, *Littoral, *Sand waves, Beaches, *Beach erosion, Profiles, Descriptors: *Sand bars.

Identifiers: Nearshore processes, Longshore cur-

Collective movements of sediment occur in the form of sand waves in the nearshore zone and affect beach topography to a significant extent. Bartype sand waves move only in the onshore direction and account for various accretive profiles on the subaerial beach. When the beach is eroded, these sand waves are simply disintegrated on the subaerial beach, instead of migrating back in the form of sand waves. These characteristics of bar-type sand waves help explain dynamic behavior of beach profiles with respect to profile configuration, sediment storage, and beach width. Cusp-type sand waves are considered to be a product of interaction between longshore currents and an erodible bed. Their presence causes varia-bility in beach profiles along the shore between those containing a prominent bar and those without a bar. Migration of these sand waves may well produce pulsational transfer of material along the shore. (Sinha-OEIS) W74-04621

WAVE PERIOD AND THE SWASH ZONE

ENERGY BALANCE, Puerto Rico Univ., Mayaguez. Dept. of Marine G S Giese

Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968, American Society of Civil Engineers, Vol 1, Part 2, Chap 25, p 401-414, 1969. 2 fig, 5 tab,

Descriptors: *Beaches. Infiltration. Waves(Water), *Sediment transport. Identifiers: Pebbles, Sorting, *Breaking waves, *Wave period. *Swash zone.

The shape sorting of pebbles in the swash zone was studied in an effort to determine the effect of the amount of foreshore infiltration per wave on the swash zone energy balance. Measurements were made of pebbles collected from the swash limit and from the step of selected sandy beaches. The pebbles were sampled on occasions when, and at locations where, the conditions of breaker height, breaker approach angle and foreshore slope fell within predetermined limits. The wave period and the foreshore infiltration rate varied among the beaches and were measured. The results of these measurements indicate that the mean shape of swash limit pebbles, and presumably, therefore, the swash zone energy balance depends upon the amount of foreshore infiltration per wave. Therefore the dynamics of the swash zone the effect of wave period and the effect of foreshore permeability must be considered together. (Sinha-OEIS) 74-04622

LITTORAL DRIFT AS FUNCTION OF WAVES AND CURRENT.

Waterloopkundig Laboratorium. (Netherlands). E. W. Bijker.

In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, Sep-tember 1968, American Society of Civil Engineers, Vol 1, Part 2, Chap 26, p 415-435, 1969. 2 fig, 12

Descriptors: *Littoral drift, *Waves(Water), *Currents(Water), Coasts, *Sediment transport, Bed load. Identifiers: Longshore transport, *Tidal currents, *Longshore currents, Ivory Coast, Abidjan, Bed

An attempt is made to compute the littoral drift, starting from the longshore current velocity as it is generated by the waves or as it may originate from other causes. For the actual computation of the bed load transport a normal bed load transport formula is used, in which, however, according to the method developed in earlier studies, the bed shear is increased as a result of the wave motion. From the tests described it becomes clear that the transport may be treated indeed as a function of the longshore current, even when this current has a direction opposite to that of the component of the wave propagation parallel to the coast. Finally, a computation procedure for littoral drift is presented in which also the transport of suspended load is taken into account, and an example is given of the computation of the littoral drift along Ivory Coast near Abidjan. The result of this computation corresponds rather well to the data known from the prototype. (Sinha-OEIS) W74-04623

SIMULATION OF HORIZONTAL TURBULENT DIFFUSION OF PARTICLES UNDER WAVES, Louisiana State Univ., Baton Rouge, Coastal Stu-

S. P. Murray

In: Proceedings of Eleventh Conference Coastal Engineering, London, England, Sep-tember 1968, American Society of Civil Engineers, Vol 1, Part 2, Chap 28, p 446-466, 1969. 11 fig, 4 tab, 19 ref. Nonr 1575(03), NR 388-002.

Descriptors: *Sediment transport, *Turbulence, *Diffusion, Fluid flow, *Fluid mechanics, Photography.
Identifiers: Shoaling, Nearshore processes, Power

spectra.

By oscillation of an array of turbulence-generating grids in still water, the turbulent fluid velocity field in shoaling waves near the bottom is simulated in a laboratory channel. Solid particles with fall velocities varying between 1 and 40 mm/sec are introduced into the test volume from above. Multiple-image photography using ultraviolet lighting techniques and a suitably placed mirror allows recording of the grain trajectories as functions of time and three space dimensions simultaneously. The Lagrangian intensities of turbulence and diffusion coefficients are then directly measured from the photographic data. The scale times, scale lengths, and the frequencies of the power spectra modes can then be calculated. Properties of the fluid turbulence are inferred from the quasi-neutral particles. The analysis, which is restricted to the component of diffusion in the horizontal direction normal to the grid motion, shows that the turbulent velocity distributions of both fluid and heavy particles are Gaussian, and that their standard deviations (intensities of turbulence) increase regularly with increasing grid Reynolds numbers (grid speeds). Diffusion coefficients likewise generally increase with increasing grid Reynolds numbers. Diffusivities of the heavy particles rela-tive to the fluid are a function of both particle fall velocity and the structure of the fluid turbulence itself. (Sinha-OEIS)

THE ATLANTIC COAST OF LONG ISLAND, Army Engineer District, New York. For primary bibliographic entry see Field 8A. W74-04626

CONSTITUENT TRANSPORT IN ESTUARIES, Oregon State Univ., Corvallis. Dept. of Civil En-For primary bibliographic entry see Field 2L.

W74-04627

WATER DENUDATION OF MOLEHILLS IN MOUNTAINOUS AREAS,

B. Jonea. Acta Theriol. Vol 17, No 21-31, p 407-412, 1972. Identifiers: Meadows, Moles, *Molehills, Moun-tainous regions, Pastures, *Poland(Karkonosze mountains), Water denudation, *Zoogenic denu-

During its burrowing activities the mole forms nu-merous molehills on the surface of fields, pastures meadows. In undulating tracts of land these molehills undergo degradation as the result of denudation and surface erosion processes. Zoogenic denudation processes are particularly active in mountainous areas owing to the climatic and topographic conditions stimulating them there, namely, rapid thawing of snow, considera-ble water flow, sharp slope gradient and existence of slippery areas of various kinds facilitating transport of rock material down slopes. In the Kar-konosze mountain area, Poland zoogenic denudation caused by the mole activity varied from 1-3 tons of rock material/ha pasture annually.—Copyright 1973, Biological Abstracts, Inc.
W74-04639

EFFECT OF THE FOREST ON THE DISPLACE-MENT OF THE DESNA RIVER BED AND THE SIGNIFICANCE OF THIS EFFECT ON FOREST PLANTING IN THE FLOODPLAIN, (IN RUS-SIAN),

For primary bibliographic entry see Field 4A.

FLOATING BREAKWATER PONTOON.

W74-04711

Reid, Middleton and Associates, Inc., Edmonds, Wash.; and Poly Sintering, Inc., Seattle, Wash. (Assignees). For primary bibliographic entry see Field 8B.

SHORE TRANSPORT. FORMATION OF SAND SPITS AND TOMBOLOS,

G. Sauvage de Saint Marc, and G. Vincent. Available from NTIS as AD-672 501, for \$6.00 paper copy, \$1.45 microfiche. California University, Berkeley, Hydraulic Engineering Lab. Technical Report No HEL-2-17, May 1968. Translation of Transport Littoral Formation De Fleches Et De Tombolos (1954). 42 p., 26 fig., 7 ref. DACW72-67-

Descriptors: *Sediment transport, Model studies, Ocean waves, Ocean currents, Littoral, *Coasts, *Sand spits, *Waves(Water), *Currents(Water), "Shallow water, Geomorphology, Translations.
Identifiers: *Littoral transport, Longshore currents, Breaking swell, Wave action.

This study of the formation of sand spits and tombolos is based upon experimenting on models. Because of the essential role of breaking waves, the discussion centers on the action of waves and currents which they generate on the transport of sand along the coast. When swells impinge obliquely on a beach, the breaking swells dig into the beach and set grains of sand into motion and then the sand can be carried away by a current. Consideration is given to the intensity of shore transport under the influence of currents due to the breaking of swells; the influence of swell amplitude, swell wave length, and steepness; the in-fluence of the nature of the sediment; influence of the breaker angle on the intensity of littoral transport; and formation of sand spits. Although the difference between a spit and a tombolo is not always clear, they seem to be formed in different ways. The formation of tombolos appears to be rehated to the motion of the swell current of 'lateral expansion' which is due mainly to the progressive decrease in amplitude of the swell in the lee of an obstacle such as an island or artificial structure (breakwaters). (Sinha-OEIS)

SURF.

Wisconsin Univ., Madison. Mathematics Research

Available from NTIS as AD-698 999 for \$6.00 paper copy, \$1.45 microfiche. Technical Summary Report No 978, July 1969. 52 p, 22 fig, 34 ref. DA-31-124-ARO-D-462

Descriptors: *Beaches, *Waves(Water), *Surf, *Bed under water, *Beach erosion, Tsunamis, Resonance, Bores, Shallow water. Identifiers: *Wave run-up, *Shore processes.

Some phases of research, over the last decade, on water waves strongly influenced by the seabed are reviewed. Progress made in the understanding of the transformation of waves into run-up and backwash on a beach is discussed. This phenomenon is closely related to the theory of singular partial differential equations. Results on the resonance of unbounded water bodies adjacent to shores are summarized. (Sinha-OEIS)
W74-04725

SEDIMENTATION IN HAWKE BAY,

Department of Scientific and Industrial Research. Wellington (New Zealand). Oceanographic Inst. For primary bibliographic entry see Field 2L. W74-04726

STUDIES OF A SOUTHERN FIORD.

epartment of Scientific and Industrial Research, Wellington (New Zealand). Oceanographic Inst. New Zealand Department of Scientific and Industrial Research Bulletin 157, New Zealand Oceano-graphic Institute Memoir No 17, 1964, 101 p.

Descriptors: Coasts, *Sedimentation, *Fjords, *Sounds, Hydrology, Ecology, Biology, Sediments, Sulfur compounds.
Identifiers: *New Zealand(Milford Sound).

A compilation is presented of eight studies on the fjordland shelf and Milford Sound, New Zealand. In addition to reports on the hydrology and sedimentation in Milford Sound, studies are reported on the biology and ecology of the Sound. Included also is a study on transformation of sulphur compounds in the sediments of the Sound. Results show that stagnation is not a phenomenon common to the bottom water of all fjords. (Sinha-OEIS) W74-04727

SELECTED BIBLIOGRAPHY ON BEACH FEA-TURES AND PROCESSES. RELATED NEARSHORE

Louisiana State Univ., Baton Rouge, Coastal Stu-

Available from NTIS as AD-464 497 for \$6.00 paper copy, \$1.45 microfiche. Coastal Studies Series No 11, November 1965. 59 p. Nonr 1575(03).

Descriptors: *Bibliographies, Geomorphology, Coasts, Oceanography, Hydrology, Meteorology, *Coastal engineering, Estuaries, *Waves(Water), *Currents(Water), Oceanography, Estuaries, *V *Currents(Water), Identifiers: Nearshore processes.

The bibliography contains approximately 75% of the most pertinent literature on the subject of beach features and related nearshore processes The material is listed by subject and by name of author. The fact that about 80 percent of the references are post-1940 reflects a lack of beach process research prior to world war II. A number of the general papers could be listed under more than one subject heading, so an evaluation of their principal content determined their classification. Specific fields covered are: coastal morphology beach ridges, dunes, inlets, storm induced changes, beach-face configuration, bottom configuration, measurement techniques, sedimen riguration, measurement techniques, sediment properties, sediment transport, beach and nearshore process, shoaling, breaking waves, tides, littoral currents, wave refraction, storms and hurricanes, acolian processes, coastal engineering and quantitative analysis. The final section contains references to special bibliographies and additional source materials. An author index is included, 1342 items are identified. (Sinha-OEIS) W74-04728

INSHORE SEA SURFACE TEMPERATURE AND SALINITY CONDITIONS AT AGATE BEACH, YAQUINA BAY AND WHALE COVE, OREGON, IN 1970, Oregon State Univ., Corvallis. Dept. of Oceanog-

raphy.
For primary bibliographic entry see Field 2L.

W74-04730

AN ANNOTATED BIBLIOGRAPHY OF FLUSH-ING AND DISPERSION IN TIDAL WATERS, Navy Hydrographic Office, Washington, D. C. For primary bibliographic entry see Field 2L.

RESEARCH IN THE COASTAL AND OCEANIC ENVIRONMENT. A SUMMARY OF RESEARCH ACCOMPLISHED UNDER PROJECT THEMIS, Delaware Univ., Newark.

For primary bibliographic entry see Field 2L. W74-04732

SEA WAVES AND BEACH CUSPS, M. S. Longuet-Higgins, and D. W. Parkin. Geographical Journal, Vol 128, No 2, p 194-201, June 1962. 3 fig, 1 tab, 11 ref.

Descriptors: *Waves(Water), *Beaches, Stratifi-cation, *Percolation, *Bays, *Erosion. Identifiers: Beach cusps, Wave height, *Swash, Shingle, *United Kingdom(England).

Some observations and experiments are briefly described that were carried out in two places on the south coast of England, at Tide Mill near the south coast of England, at the Mili hear Seaford, and on Chesil Bank, to relate the forma-tion of the cusps to the characteristics of the waves. A model-scale experiment performed by the Hydraulics Research Station, Wallingford, is also reported. It is concluded that the dimensions of the cusps are related more to the length of the swash than to the wave height or wave period, and for a given beach the mean lateral spacing between the cusps is an increasing function of the swash length. The cusps seem to form most easily when there is a vertical stratification of material, with relatively coarse shingle at the surface and a mixed, impermeable layer a few inches beneath. This can be quite simply explained in terms of the mobility of the material in the swash zone; an underlying impermeable layer reduces the percola-tion of the swash through the beach and so increases the power of the waves to move the shin-gle. Further the heaped shingle on the cusp promontories is more permeable than the thinner layer in the bays, and consequently is less subject to erosion. This contributes to the relative per-manence of the cusp system. Waves whose height is too great for the dimensions of the cusps tend to sweep over the cusp promontories and destroy them. (Sinha-OEIS) W74-04734

BEACH PROFILES OF A GEORGIA BARRIER

ISLAND, Georgia Univ., Sapelo Island. Marine Inst.

O. H. Pilkey, and D. M. Richter. Southeastern Geology, Vol 6, No 1, p 11-19, 1965.

Field 2-WATER CYCLE

Group 2J-Erosion and Sedimentation

*Georgia, *Beaches. Descriptors: islands, *Profiles, Seasonal, *Erosion, Storms. Identifiers: Sapelo Island(GA).

Seasonal beach profiles were obtained from seven stations at the south end of Sapelo Island, Georgia, during 1963. Except for accretion at the extreme south tip of the island, most of the study area is being eroded. Unlike other beaches re-ported in the literature, the seasonal and observed storm changes of the Sapelo Island beach are slight. (Sinha-OEIS)

EOLIAN CROSS-BEDDING IN THE BEACH DUNE ENVIRONMENT, SAPELO ISLAND, GEORGIA,

Georgia Univ., Sapelo Island. Marine Inst. L. S. Land.

Journal of Sedimentary Petrology, Vol 34, No 2, p 389-394, June 1964. 4 fig, 2 tab, 13 ref.

Descriptors: *Georgia, *Barrier islands, *Dunes, *Sediment transport, *Beaches, *Wind erosion, Aeolian soils, Stratification. Identifiers: Sapelo Island(GA), *Eolian deposition

The slipfaces of modern beach dunes on Sapelo Island, Georgia, are deposited by the prevailing, competent, dry winds rather than the high energy storm winds. High angle cross-bedding (crossbedding which dips at least 30 deg) records the orientation of the prevailing winds. Approximately one-half the dune slipfaces and high angle crossbeds are stable at angles which exceed the angle of repose of dry sand, and cross-bed dips as high as 42 deg are stable in, and may be indicative of, the beach dune environment. Elongate sand grains are preferentially oriented parallel to the dip direction of the eolian cross-beds. (Sinha-OEIS)

HIGH-ANGLE BEACH STRATIFICATION, SAPELO ISLAND, GEORGIA, Georgia Univ., Sapelo Island, Marine Inst.

Journal of Sedimentary Petrology, Vol 32, No 2, p 309-311, June 1962, 3 fig. 2 ref.

Descriptors: *Georgia, *Beaches, Islands, Sand bars, *Stratification, *Barrier islands, *Slopes. Identifiers: Sapelo Island(GA).

Foreshore sand bars at Sapelo Island typically have a steep landward slope. Deposition on this slope results in landward movement of the bar. The deposits are characterized by high-angle cross-stratification with dips as steep as 30 degrees. The dip of stratification formed on the steep landward face of bars of the foreshore beach reaches angles of 30 degrees. Bars up to 5 feet high are common features on the Sapelo Island Beach. Similarly formed stratification in ancient rocks may be measured with angles in excess of the 30 degree maximum observed at Sapelo Island if the beach surface is used as a horizontal datum. (Sinha-OEIS) W74-04738

RHOMBOID RIPPLE MARK, INDICATOR OF CURRENT DIRECTION AND ENVIRONMENT, Georgia Univ., Sapelo Island. Marine Inst. J. H. Hoyt, and V. J. Henry, Jr.

Journal of Sedimentary Petrology, Vol 33, No 3, p 604-608, September 1963. 4 fig, 10 ref. NSF G-

Descriptors: *Ripple marks, *Beaches, *Sands, *Sediment transport, *Waves(Water), *Littoral, Environments, *Currents(Water). Identifiers: Wave backwash, Washover, Current

flow, Rhomboid ripple marks.

The direction of current flow over the beach surface may be determined from the shape of rhomboid ripple marks. Characteristically these ripples are bowed in the direction of current flow and are pointed up-current. They are formed foreshore beach by wave backwash and by washover of low bars. The washover ripples result from thin sheets of water moving shoreward over the bars. At Sapelo Island, Georgia, rhomboid ripples are best developed on slopes of 1/2 to 2 deg. The beach material is predominately fine sand. There is a direct relation between the length-width ratio of rhomboid ripples and the slope of the beach surface. (Sinha-OEIS) W74-04739

FLUME EXPERIMENTS ON SAND TRANS-PORT BY WAVES AND CURRENTS, Scripps Institution of Oceanography, La Jolla,

For primary bibliographic entry see Field 2L.

W74-04746

SUSPENDED SEDIMENT DUE TO WAVE AC-

Tokyo Univ., (Japan). Dept. of Civil Engineering. M. Hom-ma, and K. Horikawa.

In: Proceedings of Eighth Conference on Coastal Engineering, Mexico City, November 1962, Part 2, Chap 13, p 168-193, 1963. 19 fig, 2 tab, 28 ref.

Descriptors: *Waves(Water), *Sediment transport, *Powerpla *Shallow water. *Powerplants, Cooling water, Ripple marks,

Identifiers: Surface wave: Suspended sediments, *Japan. waves, Wave action,

Field and laboratory investigations were made to determine the concentration patterns of suspended sediment due to action of surface waves. The distribution patterns of suspended sediment sampled at an open coast were studied in relation to functional and structural design of the cooling water intake system for the atomic power plant now under construction at the Pacific Ocean coast of Tokai, Ibaragi Prefecture, Japan. (Sinha - OEIS) W74-04747

LABORATORY STUDY OF SCALE EFFECTS IN

TWO-DIMENSIONAL BEACH PROCESSES, Kyoto Univ., (Japan). Disaster Prevention Research Inst.

For primary bibliographic entry see Field 2L. W74-04748

LONGSHORE CURRENTS IN ONE MULTI-BAR PROFILES RELATION TO LIT-TORAL DRIFT, Florida Univ., Gainesville. Coastal Engineering

Lab. For primary bibliographic entry see Field 2L. W74-04749

RHYTHMIC PATTERN OF LONGSHORE BARS RELATED TO SEDIMENT CHARAC-

Tokyo Univ. (Japan). Dept. of Civil Engineering M. Hom-ma, and C. Sonu.

In: Proceedings of Eight Conference on Coastal Engineering, Mexico City, November 1962, American Society of Civil Engineers, Part 2, Chap 16, p 248-278, 1963. 29 fig, 2 tab, 9 ref.

Descriptors: *Currents(Water), *Waves(Water), Coasts, *Sediment transport, *Sand bars, Sand waves, *Shallow water, Shoals, *Littoral drift, Erosion, Deposition(Sediments).

*Japan, Beach cusps, Arcuate sand bars, En echelon san bars, Longshore currents, Longshore bars, Nearshore processes, Bottom topography, Shoreline waves, Giant ripple marks, Shoreline configuration.

The origin and movement are discussed of nearshore and underwater sand bars which are seen on aerial photographs taken on the coast of Japan. The bars are described as arcuate and in many cases are found en echelon or in parallel arrangements. The rhythmic bar pattern is correlated with dynamic or static factors such as shoreline configuration, shore face slope and deposits, bot-tom topography, transformation of incident tom topography, transformation of incident waves, longshore currents and littoral drift. Impli-cations for coastal engineering are suggested. (Sinha-OEIS) W74-04750

LABORATORY APPLICATIONS OF RADIOISOTOPIC TRACERS TO FOLLOW BEACH SEDIMENTS, Corps of Engineers, Washington, D.C. Beach Ero-

sion Board

In: Proceedings of Eighth Conference on Coastal Engineering, Mexico City, November 1962, Amer-ican Society of Civil Engineers, Part 2, Chap 17, p 279-303, 1963. 23 fig. 10 ref.

Descriptors: *Sediment transport, *Tracers, *Radioisotopes, *Beaches, *Waves(Water), *Currents(Water).
Identifiers: *Nearshore processes, Swash,

Identifiers: Onshore-offshore movements.

Laboratory applications of the use of radioisotopic tracers for the study of sediment transport are described. Information is given on the equipment, the test basin and conditions and test operations. Results are given in time references. The results seem to indicate several mechanisms which had not formerly been detected. The first of these is a changing movement in the onshore-offshore direction. While there has been an enrichment of the activity by a seaward movement of sediment and tracer material, there are also periods of low activity or low counting rate. Seaward moving uncontaminated sediments could cover the activity and lower the count rate. However, the uncover-ing of the isotopic tracer as evidenced by the high rates negates such reasoning and points toward an oscillatory motion, onshore-offshore. Analysis of the elevation data fail to clarify this problem as the phenomenon is not recognized in those data. A second mechanism of somewhat similar nature has been discussed as the pulsating transport of sediments in the alongshore direction. It appears that slugs of activity move in the alongshore direction. These slugs are separated from each other by areas of low activity and and appear to form and move independently from each other. Finally the deep alongshore movement had not been determined before by elevation measurements although it was known to exist from earlier experimental work. It may be that this deep movement, in water depths of approximately 1 foot, is quite significant in that the magnitude of activity appears to be of the order of one-half that of the material moving in the zone of wave swash and one-fourth or less of that moving along the zone of wave plunge. (Sinha OFIS) W74-04751

A STUDY OF CRITICAL DEPTH AND MODE OF SAND MOVEMENT USING RADIOACTIVE

Ministry of Transportation, Yokosuka (Japan). Port and Harbour Research Inst.

S. Sato, T. Ijima, and N. Tanaka.
In: Proceedings of Eighth Conference on Coastal
Engineering, Mexico City, November 1962, American Society of Civil Engineers, Part 2, Chap 18, p 304-323, 1963. 17 fig. 1 tab, 2 ref.

Descriptors: *Sediment transport, *Tracers, *Radioisotopes, Sands, *Waves(Water), *Ripple marks, Coasts, *Shallow water. Identifiers: Japan, Breaker zone, Chromium 51, Surf zone, Wave action, Water depth, Nearshore

Erosion and Sedimentation—Group 2J

The qualitative characteristics of sand movement in the offshore and the breaker zone and the relations of waves, depth and bottom materials are estimated from field experiments. Moreover, in the model test, the glass sand containing Cr-51 was used in order to study the mode of sand movement due to waves, in particular, the direction of ripple movement and sand transport. (Sinha - OEIS) W74-04752

TRACING COASTAL SEDIMENT MOVEMENT BY NATURALLY RADIOACTIVE MINERALS, California Univ., Berkeley. Coll. of Engineering. A. M. Kamel, and J. W. Johnson

In: Proceedings of Eighth Conference on Coastal Engineering, Mexico City, November 1962, American Society of Civil Engineers, Part 2, Chap 19, p 324-330, 1963. 4 fig., 4 ref.

Descriptors: *California, *Littoral drift, Sands. *Tracers, *Sediment transport, *Refraction(Water waves), *Waves(Water), Radioactivity waves), techniques.

Identifiers: Heavy minerals, Thorium, Th-232, Wave action, Sorting.

Thorium (Th-232, 0.238 mey) was used as a natural tracer to determine the direction of littoral drift along the California coast. Radioactive thorium is added naturally at discrete places along the coast where rivers flowing through thorium rich granite outcrops reach the coast or where the thorium rich granite itself outcrops at the sea coast. The choice of the concentrations of both thorite and heavy minerals in parts per million and per cent, respec-tively, in sand samples collected at mid-tide from different places along the beach, are believed to be two good parameters for the study of the effect of progressive sorting and consequently the determination of the direction of littoral drift along the coast. (Sinha - OEIS) W74-04753

SOME CHARACTERISTICS OF THE DUTCH COAST, Rijkswaterstaat-Deltadienst,

Hague (Netherlands). Coastal Research Dept. T. Edelman, and D. N. Eggink.

In: Proceedings of Eighth Conference on Coastal Engineering, Mexico City, November 1962, American Society of Civil Engineers, Part 4, Chap 41, p 756-764, 1963. 5 fig.

Descriptors: *Waves(Water), *Currents(Water), *Tidal effects, Coasts, *Shallow water, *Sediment transport, Erosion, Deposition(Sediments).
Identifiers: Tidal currents, Wave action,
Nearshore processes, Tidal range, *Netherlands.

Sediment transport along the Dutch coast is discussed in some detail. Consideration is given to the effect of waves and tidal currents on a nondisturbed coast. It is suggested that transport-capacity of a tidal current will increase with the tidal range. If the tidal range increases along the coast in the direction of propagation of the tidal wave, the coast will be eroded. A decreasing tidal range in that direction will cause an accretion. The transport-capacity of waves changes with the direction in which the waves approach the coast. This means that, if a dominant wave-direction exists, the curvature of the coast must be responsible for erosion or accretion by wave action. (Sinha -OFIS) W74-04754

SIMILARITY IN SEDIMENT TRANSPORT DUE TO WAVES,

Hydraulics Research Station. Wallingford (England). S. Yalin, and R. C. H. Russell.

In: Proceedings of Eighth Conference on Coastal Engineering, Mexico City, November 1962, Amer-ican Society of Civil Engineers, Part 2, Chap 12, p 151-167. 11 fig. 5 ref.

Descriptors: *Waves(Water, *Sediment transport, Model studies.

Identifiers: Wave height, Orbital motion, Ripple height. Ripple length.

The movement by waves of cohesionless sediment lying on a horizontal bed is discussed. In particular the number of dimensionless parameters that are necessary to define the 2-phase motion at the bed is described, the specification of which would ena-ble similarity to be obtained. In general four dimensionless parameters are necessary; but when the motion of the water at the bed can be adequately defined by an orbit length and a period, the two-phase motion can be described by the numerical value of three dimensionless parameters. This condition is satisfied when the wave-height is low, because then the orbital motion at the bed is idal and the drift velocity is negligible Model and prototype experiments were conducted in a wave channel, using low waves, in which the scale for depth of water and for wavelengths was 3/10. The dependent parameters, three of which are sufficient to verify similarity of all aspects of the phenomenon were chosen to be ripple height, e length and transport of sediment. The identity of the dimensionless numbers signifying the rip-ple height, ripple length and transport in model and prototype is proof that similarity had been obtained. (Sinha - OEIS) W74-04755

DRASTIC BEACH CHANGES IN A LOW-ENER-GY ENVIRONMENT CAUSED BY HURRICANE

Florida State Univ., Tallahassee. Oceanographic

D. A. Warnke, V. Goldsmith, P. Grose, and J. J.

Journal of Geophysical Research, Vol 71, No 6, p 2013-2016, April 15, 1966. 3 fig. 2 tab, 6 ref.

Descriptors: *Hurricanes, *Beaches, *Erosion, *Sedimentation, Wave pile-up, *Florida, Coasts, *Tidal effects, Shoals, Storms.

Identifiers: Low energy environments, Wave action, Panama City(FL), Nearshore processes.

A number of beach surveys were made in the course of terrain-analytical studies in the Big Bend area of Florida. The area of Alligator Spit and the islands to the southwest have been classified as a low-energy environment on the basis of estimates of average breaker height. The rate of erosion was greatest during the passage of hurricanes through the Gulf of Mexico, but it was not necessarily directly related to the passage of hurricanes through the Big Bend area. Beach changes associated with the passage of hurricane Betsy (September 8-10, 1965) through the Gulf of Mexico are described quantitatively. These changes are illustrated in the maps and diagrams. It is possible that, because of the east-west path of the hurricane through the Gulf of Mexico, wind-driven water from the eastern sectors of the hurricane was piled up against the beaches at Alligator Spit, resulting in spectacular high tides - about 75 cm above the expected highs. These high tides allowed even moderate wave action to influence a region of the beach which usually is above wave action. Reconnaissance trips to various localities near Alligator Spit and the Panama City beaches immediately after hurrican Betsy revealed pronounced erosion and retreat of the forward dune aprons, where these are present. The eroded material everywhere seemed to be accumulated in widespread shoals near shore. The over-all land-ward retreat of the forward dune aprons, and the relatively constant widths of the beaches through time, indicate, among other factors, that most of the beach loss is permanent. (Sinha - OEIS) W74-04756

DEVELOPMENT AND GEOLOGIC NIFICANCE OF SOFT BEACH SAND, Georgia Univ., Sapelo Island. Marine Inst. J. H. Hoyt, and V. J. Henry, Jr. GEOLOGIC

Sedimentology, Vol 3, p 44-51, 1964. 4 fig, 1 tab, 8

Descriptors: South Carolina, Georgia, Florida, *Beaches, *Dunes, *Sands, *Bubbles, Environment, *Southeast U.S.

Identifiers: *Soft beach sand, Eolian deposits.

The firmness of sand beaches is variable. Some areas of soft sand are due to a spongelike, bubble development up to 16 inches in thickness in the upper part of the beach. The bubbles are formed by air trapped in sand when the area is flooded by the rising tide. Air remains in the sand as bubbles which tend to enlarge to as much as 1/2 inch in diameter with repeated draining and flooding. A critical factor in the development of the bubbles appears to be the dryness of the sand deposit. appears to the tryings of the saint deposit.

Eolian deposits on the upper beach are particularly susceptible to bubble development. When exposed on the beach surface, the bubbles result in depressions superficially similar to raindrop imprints. The development and subsequent compaction of the bubbles may leave a permanent record by disrupting the laminae and resulting in a more homogenous appearing bed. The orientation of elongate sand grains is also markedly affected. Bubbles, bubble depressions, disrupted laminae and grain reorientation in addition to altering the original properties of the sand deposit may be useful in establishing the depositional environment. (Sinha - OEIS) W74-04757

WAVES GENERATED BY HORIZONTAL MO-

TION OF A WALL, Army Coastal Engineering Research Center, Washington, D.C. For primary bibliographic entry see Field 8B. W74-04760

PHENOMENA AFFECTING IMPROVEMENT OF THE LOWER COLUMBIA ESTUARY AND ENTRANCE.

Corps of Engineers, Portland, Oreg. Special Projects Investigation Section. For primary bibliographic entry see Field 2L. W74-04763

NUCLEONIC SEDIMENT CONCENTRATION GAUGE - COMPARISON OF TRANSMISSION AND SCATTERING MODES,

Bhabha Atomic Research Centre, Bombay (India). Isotope Div.

K. Krishnamurthy, S. M. Rao, and R. Rajagopalan.

International Journal of Applied Radiation and Isotopes, Vol 24, No 11, p 579-583, October 1973. 3 fig, 1 tab, 7 ref.

Descriptors: *Suspended solids, *Measurement, *Instrumentation, *Sediments. Identifiers: *Nucleonic gauge, Counting, Scattering mode, Transmission mode, Detection limits.

Recent interest in the development of nucleonic gauges for measuring the concentration of suspended sediments in streams prompted this comparison of the transmission and scattering modes of operation for such instruments. It was found that there is hardly any difference in the performance of the gauge in either mode of opera-tion. This could be predicted by the theory as well. The standard deviation under the experimental conditions corresponds to about 700-750 ppm. Besides the fact that there is little or no difference in both types of gauges, since scattering of low energy gamma radiation of 60 keV does not appreciably alter the photon energy even under mul-tiple scattering (mean free path: 5 cm), the dependence on the chemical nature of the sediment will be similar to that with the original energy gamma rays. It was also concluded that the nucleonic sediment concentration gauge with Am-241 may not be good for measurement of concentrations below 3000 ppm. (Mortland-Battelle)

Field 2-WATER CYCLE

Group 2J-Erosion and Sedimentation

A SYRINGE GAS-STRIPPING PROCEDURE FOR GAS-CHROMATOGRAPHIC DETER-MINATION OF DISSOLVED INORGANIC AND ORGANIC CARBON IN FRESH WATER AND

CARBONATES IN SEDIMENTS, Fisheries Research Board of Canada, Vol 30, No 10, p 1441-1445, October 1973. 2 fig. 1 tab, 9 ref. primary bibliographic entry see Field 5A. W74-04788

CALCULATION OF CRITICAL DISCHARGE VELOCITY OF STREAMS IN UNIFORM FLOW AND THE TRANSPORTED SEDIMENT SIZE,

M. S. Quraishy.
Sind University Research Journal (Science Series) Vol 5, No 2, p 215-220, 1971. 1 fig. 3 ref.

*Sediment *Discharge(Water), *Bed load, *Equations, Settling velocity, Depth, Particle size, Shear stress, Viscosity, Channel morphology.

Critical discharge velocity for initiation of bed load movement is the basis of nondimensional relations by which the various critical discharge data can be correlated and interpreted. However, the form of these expressions makes it difficult to calculate the particle sizes of the corresponding terminal velocities. A method is given to overcome this difficulty. (Knapp-USGS) W74-04800

THE PROBLEM OF CRITICAL DISCHARGE IN

SEDIMENT MOTION,
Planning Commission, Karachi (Pakistan). Water and Power Section.

M. S. Quraishy. Engineering News, Vol 9, No 2, June 1964. 8 p. 2 fig. 12 ref.

Descriptors: *Sediment transport, *Discharge(Water), *Bed load, *Equations, Settling velocity, Depth, Particle size, Shear stress, Viscosity, Channel morphology.

Nondimensional functional relations correlate the product of critical discharge per unit width and the hydraulic gradient or slope of streams in uniform flow with sediment characteristic size. The solution of critical discharge presumes a knowledge only of the interrelation between the critical shear stress velocity and the mean velocity. The various relations for the critical or threshold condition, by the definition of general motion, are also the rela-tions for correlating data on initiation of bed con-figurations. (Knapp-USGS) W74-04801

RESPONSE AND RECOVERY OF A PIEDMONT WATERSHED FROM TROPICAL STORM AGNES, JUNE 1972,

Maryland Geological Survey, Baltimore. I F Costa

Water Resources Research, Vol 10, No 1, p 106-112, February 1974. 7 fig, 2 tab, 13 ref. USGS Grant 14-08-0001-G-38.

Descriptors: *Floods, *Hurricanes, *Atlantic Coastal Plain, *Maryland, *Erosion, Plain, Geomorphology, Channel morphology, Rainfall-runoff relationships, Stage-discharge relations. Identifiers: Tropical storm Agnes(1972).

Tropical storm Agnes generated flooding with a recurrence interval much greater than 100 years in a Piedmont watershed: 633 cfs per sq mi from 60 sq mi. Deposits on floodplains were scarce. Deposition occurred where tributaries joined the main channel, across meander boods, and below valley constrictions such as roads and bridges.

Despite the magnitude of the rainfall and flooding

there were no slope failures in the basin. The only modifications to the watershed were observed in the lowlands along the main channels. Channel widening was the most spectacular modification. Within I year of the flood, channel cross sections were well along recovery. Meandering reaches of the channel recovered faster than straight reaches. The Agnes flood is nearly the largest ever reported from a Piedmont watershed of this size. Large floods in the Piedmont apparently play a minor rioci in shaping the landscape, whereas large floods in the Blue Ridge/Valley and Ridge and Appalachian Plateau provinces, and consequent slope failure, are very active landscaping agents. (Knapp-USGS)

PROPAGATION OF A FINITE-AMPLITUDE SURFACE WAVE WITH ALLOWANCE FOR RANDOM IRREGULARITIES OF THE BOT-

TOM, Nauchno-Issledovatelskii Radiofizicheskii In-

Y. M. Pelinovskiy.
Atmospheric and Oceanic Physics, Vol 7, No 11, p 804-805, May 1972. 1 fig. 9 ref. Trans. from Rus-

*Shallow Descriptors: *Shallow water, Bores, *Waves(Water), *Gravity waves, *Winds, Coasts. Identifiers: *Solitary waves, *Bottom topography,

The behavior of the wave surface was considered in the presence of random irregularities of the bottom. Using the method of characteristics, equations of the 'shallow water' theory are solved. This solution holds up to the point where the discon-tinuity occurs. To find the coordinate at which the wave forms involves solving the indirect variational problem for a function of the depth function. At a random distribution of depths, the problem can be reduced to the known problem of whether a Brownian particle can reach the boundaries of some region. The 'shallow water' theory is asymptotic. At sufficiently small amplitudes the waves are not overturned and the bore disintegrates into a succession of solitary waves. The presence of an entire region of random generation of solutions is an additional source for generation of random oscillations in the coastal zone, attributed at present to nonlinear interaction between gravity waves and wind. (Sinha-OEIS)

SUSPENDED AND BEDLOAD SEDIMENT TRANSPORT IN THE SNAKE AND CLEAR-WATER RIVERS IN THE VICINITY OF LEWISTON, IDAHO,

Geological Survey, Boise, Idaho. W. W. Emmett, and H. R. Seitz. Geological Survey Basic-data Report, 1973. 78 p, 26 fig. 16 tab. 4 ref.

Descriptors: *Baseline studies, *Sediment transport, *Design criteria, *Levees, *Idaho, Hydraulic structures, Engineering structures, Data collections, Hydrologic data, Streamflow, Runoff, Sedi-mentation, Bed load, Computer programs, Forecasting, Planning. *Snake River(Ida), Clearwater Identifiers:

Backwater on the Snake River and Clearwater River arms of the pending (1975) impoundment of water in back of Lower Granite Dam will necessitate construction of levees in the Lewiston, Idaho, area. Sediment transport and bedload data are presented for use in computer modeling aimed at defining design height of the levees. Information is summarized from data collected from March 1972 through June 1973. For both rivers, the volumes of runoff in the spring of 1972 were siderably greater than normal, and peak flows were moderately higher than normal. Both volumes of runoff and rates of peak flow were considerably less than normal during the spring of 1973. Thus, data are included for a wide range in values of streamflow. (Woodard-USGS)

2K. Chemical Processes

DETERMINATION OF THE COMPLEXING CAPACITY OF NATURAL WATER, North Carolina State University at Raleigh. De-

partment of Chemistry. K. W. Hanck, and J. W. Dillard.

Available from National Technical Information Service as PB-227 874 \$4.00 in paper copy, \$1.45 in microfiche. Water Resources Research Institute of University of North Carolina UNC-WRRI Report No 85, December 1973, 73 p, 10 fig, 15 tab, 45 ref, 3 append. OWRR A-052-NC(1), 14-31-0001-3533.

Descriptors: *North Carloina, Volumetric analysis, *Polaragraphic analysis, *Analytical techniques, Metals, EDTA, Ions, Pollutant identification, Cobalt. Neuse Identifiers: River(N.C.). *Voltammetry(Anodic stripping), Complexing capacity, *Ligands, *Metal ions.

An analytical procedure for chemically measuring the complexing capacity (ability of a water to com-plex metal ions) of natural water is developed and tested. The procedure can be used in evaluating the role of natural complexing agents in the transport, toxicity, and availability of trace metal ions in natural waters. Three methods were evaluated, two based on micro scale complexometric titration using anodic stripping voltammetry, and a third, the recommended procedure, involving chemical conversion of the ligands (substances capable of forming metal complexes with metal ions) in the sample to the corresponding cobalt (III) complex. Differential pulse polarography was used to moni-DITTERENTIAL PULSE POLATOGRAPHY WAS used to monitor the decreases in cobalt (III) concentration after production of the cobalt (III) complexes and hence the complexing capacity of the sample. This procedure has a detection limit of 0.6 micromoles of ligand per liter. (McJunkin-North Carolina)

GEOCHEMISTRY OF PERMAFROST AND QUATERNARY STRATIGRAPHY, Arizona State Univ., Tempe.

For primary bibliographic entry see Field 2C. W74-04364

IONIC MOBILITY IN PERMAFROST, Cold Regions Research and Engineering Lab., For primary bibliographic entry see Field 2C. W74-04382

THE NEED OF GEOLOGICAL INVESTIGA-TIONS FOR THE DEVELOPMENT OF THE GROUND WATER RESOURCES OF THE REPUBLIC OF KOREA,

Geological Survey, Reston, Va. Water Resources

For primary bibliographic entry see Field 4B. W74-04466

EVALUATION OF THE GROUND-WATER SUPPLY AT EIGHT SITES IN GLACIER NATIONAL PARK, NORTHWESTERN MONTANA, Contoxing I Supply Welstern Montana, Geological Survey, Helena, Mont. For primary bibliographic entry see Field 2F. W74-04469

MASS SPECTROMETRY AND INHOMOGENE-OUS ION OPTICS.

Rensselaer Polytechnic Inst., Trov. N.Y. For primary bibliographic entry see Field 5A. QUANTITY AND CHEMICAL QUALITY OF LOW FLOW IN THE EAST FORK SAN JACIN-TO AND WEST FORK SAN JACIN-TO AND WEST FORK SAN JACIN-TO RIVERS Geological Survey, Austin, Tex. For primary bibliographic entry see Field 5B.

EVALUATION AND SIMULATION OF CHEMI-CAL-QUALITY DATA FOR FIVE MONTANA SAMPLING STATIONS, Geological Survey, Helena, Mont.

L. R. Frost, Jr.

Open-file report, 1974. 50 p. 17 fig. 17 tab. 9 ref.

Descriptors: *Water quality, *Water chemistry, *Simulation analysis, *Montana, Sampling, *Hydrologic data, Regression analysis, Computer programs, technifiers: *Yellowstone River basin(Mont).

Chemical water-quality data for five daily sampling stations in Montana were analyzed to determine relationships existing between specific conductance or streamflow and the concentrations of the major inorganic constituents. Regression parameters were obtained from data collected from 1961 to 1970. Comparison of laboratory data with simulated data for monthly constituent loads at one station indicated that the more abundant constituents could generally be simulated within 15% of the values computed from laboratory data. Agreement between discrete sample data and corresponding simulated data indicated that the same general agreement could exist for the remaining four stations. (Knapp-USGS)

SURFACE-WATER AVAILABILITY, LAU-DERDALE COUNTY, ALABAMA, Geological Survey, University, Ala. For primary bibliographic entry see Field 2E. W74-04494

RECONNAISSANCE OF THE GROUND-WATER RESOURCES OF CIMARRON COUNTY, OKLAHOMA,

Geological Survey, Washington, D.C. For primary bibliographic entry see Field 4B. W74-04495

ENVIRONMENTAL CHEMISTRY: AIR AND WATER POLLUTION, Weber State Coll., Ogden, Utah. Dept. of Chemis-

For primary bibliographic entry see Field 5B. W74-04513

VISCOSITY MEASUREMENTS OF WATER IN REGION OF ITS MAXIMUM DENSITY, Department of the Environment, Ottawa (Ontario). Inland Waters Directorate.

D. J. Kingham, W. A. Adams, and M. J. McGuire.
Journal of Chemical and Engineering Data, Vol 19, No 1, p 1-3, January 1974. 2 fig. 3 tab. 27 ref.

Descriptors: *Water properties, *Viscosity, *Density, *Thermodynamic behavior, Temperature, Thermal properties, Equations.

The viscosity of water was measured at closely spaced intervals in steps of 0.5C over the temperature range 0-10C with a precision of plus or minus 0.014%. Fitting the data to a combined Arrhenius-Vogel equation revealed no thermal anomalies in the rheological behavior of water at the temperature of its maximum density. The tabulated data span the temperature range that is of considerable environmental importance. They should also serve to quiet controversies over previously reported literature values of water viscosities which had a precision of plus or minus 0.6% at best. (Brown-IPC)

INFLUENCES OF SOIL DENSITY, CLAY SILT AND HUMUS CONTENT ON MEASUREMENTS OF SOIL WATER BY NEUTRON GAUGES, (IN GERMAN).

GERMAN),
Technische Universitaet, Munich (West Germany), Institut fuer Pflanzenbau und Pflanzenzuechtung

For primary bibliographic entry see Field 2G. W74-04556

OVERGROWTH OF OOZE IRON-MANGANESE MICROORGANISMS STUDIED BY ELECTRON MICROSCOPY. (IN RUSSIAN). Akademiya Nauk SSSR, Leningrad. Institut

Ozerovedeniya. For primary bibliographic entry see Field 5A. W74-04558

CHEMICAL QUALITY OF STREAMS, AL-LEGHENY RIVER BASIN AND PART OF THE LAKE ERIE BASIN, NEW YORK.

Geological Survey, Albany, N.Y.

M. H. Frimpter.

New York State Department of Environmental Conservation, Basin Planning Report ARB-3, 1973. 79 p. 38 fig. 8 tab, 27 ref.

Descriptors: *Water quality. *Chemical analysis. *New York, Streams, *River basins, Precipitation(Atmospheric), Streamflow, flow rates, Low flow, Groundwater movement, Hydrologic cycle, Hydrologic data, Sampling, Water chemistry, Water analysis, Correlation analysis, Geology, Water pollution sources, Thermal pollution. *Lake Erie.

Identifiers: *Allegheny River Basin(N Y).

Data are presented from an investigation of chemical quality of streams in the Allegheny River basin and part of the Lake Erie basin. New York, in 1967. The study area includes about 2,200 square miles in the southwestern corner of New York State and lies almost entirely in the Allegheny Plateau physiographic province. The area can be divided into four regions on the basis of chemical quality of streamflow. Streams in Region I drain a nonglaciated area and contain a soft (range of hardness, 20-57 mg/liter as CaCO3) calcium bicarbonate type water. Water in streams of Region II, a glaciated region, has hardness ranges from 61 to 180 mg/liter, and the water is calcium bicarbonate type. Water in streams of Region III, on the Lake Erie Plain, has hardness ranging from 103 to 221 mg/liter. Water type varies and may be calcium bicarbonate, calcium sulfate, or a mixed calcium bicarbonate and sulfate type. Dissolved-solids content of streams in Regions I. II. and III is generally less than 500 mg/liter at low flow. Streams in Regions I, II, and III are unaffected by oilfield brine. Region IV encompasses the drainage areas of oilfields where the stream water is usually sodium chloride type. Hardness of water in Region IV ranges from 84 to 2,100 mg/liter and dissolvedsolids content ranges from 70 to 7,480 mg/liter. (Woodard-USGS) W74-04593

AVAILABILITY OF GROUND WATER IN THE WINNSBORO AREA, LOUISIANA. Geological Survey, Baton Rouge, La. For primary bibliographic entry see Field 4B.

THE USE OF COMPUTER SIMULATIONS FOR SYSTEMS ECOLOGICAL STUDIES IN THE BALTIC.

Stockholm Univ. (Sweden). Asko Lab. For primary bibliographic entry see Field 5B. W74-04634

W74-04596

COMMENTS ON VERONIS' PAPER. 'ON PROPERTIES OF SEAWATER DEFINED BY TEMPERATURE, SALINITY. AND PRESSURE'.
Moscow State Univ. (USSR). Dept. of Oceanolo-

O. I. Mamayev. Journal of Marine Research. Vol 31. No 1. p 90-91. 1973. 3 ref.

Descriptors: Oceanography, *Mathematical models, *Temperature, *Salinity, *Density, *Water properties, Model studies, Equations, Graphical analysis, Pressure, Water pressure, *Sea water.

The orthogonal variable to the potential density curve which Veronis (1972) (See W73-13477) sugested as a useful complement to the information contained in potential density, was originally proposed by Mamayev in 1962. In that paper the existence of the line integral along the temperature - Salinity (T-S) curve in the T-S plane was demonstrated; and the integral was shown to be equal to the definite integral of the main part of vertical stability. E. The original theoretical problem was further developed by Mamayev in 1970. Equations showing the existence of the variable on the T-S plane, orthogonal to the density are presented, which are analogous to the Cauchy-Riemann equations. (Jerome-Vanderbilt) W74-04658

THIN-LAYER AND GAS-CHROMATO-GRAPHIC DETERMINATION OF PHENOLS PRESENT IN WATER. (IN GERMAN). Mainz Univ. (West Germany). Hygiene Institut. For primary bibliographic entry see Field 5A. W74-04684

USE OF A SILVER-SULFIDE ELECTRODE FOR STANDARDIZING AQUEOUS SULFIDE SOLUTION IN DETERMINING SULFIDE IN WATER. Fisheries Research Board of Canada. Winnipeg (Manitoba). Freshwater Inst. For primary bibliographic entry see Field 5A. W74-04777

2L. Estuaries

A THREE-DIMENSIONAL MODEL FOR ESTUARIES AND COASTAL SEAS: VOLUME I, PRINCIPLES OF COMPUTATION, PAND Corp. Sants Monico, Calif

RAND Corp., Santa Monica, Calif.

J. J. Leendertse, R. C. Alexander, and S. K. Liu.
Available from National Technical Information
Service as PB-227 957 \$3.75 in paper copy, \$1.45 in
microfiche. Completion report, R-1417-OWRR,
December 1973, 57 p. 24 fig. 14 ref. 2 append.
OWRR-C-4261(9040)(1), 14-31-0001-9040.

Descriptors: *Estuaries. *Mathematical models. *Numerical analysis, Tides, Fluid dynamics, Computer models. Coastal engineering. Simulation analysis, Unsteady flow. Model studies. Finite element analysis.

Identifiers: *Three dimensional flow.

Primciples of computation are described for a three-dimensional model of estuaries, bays, and coastal seas in which nonisotropic density conditions exist. Numerical integration of the finite difference equations for motion, transport, and continuity are used. In these equations the vertical momentum exchange is quadratically related to horizontal velocities, and the effects of vertical accelerations are neglected. The computational method has been tested on a number of basins with boundaries of increasing complexity. A computation for a large lake with irregular boundaries and depth with a horizontal grid of 1000 points and 8 layers took 30 minutes on an IBM 360-91 for a real-time simulation of 67 hours in 4000 time steps. Results indicate that three-dimensional flows can be computed effectively according to the method described.

Field 2-WATER CYCLE

Group 2L—Estuaries

W74-04301

THE RESPONSE TO TIDAL FLUCTUATIONS OF A LEAKY AQUIFER SYSTEM,

Hawaii Univ., Honolulu. Research Center. Water Resources For primary bibliographic entry see Field 2F. W74-04308

ESTUARIES, W. M. Cameron, and D. W. Pritchard. In: The Sea, Vol 2, Composition of Sea-water. M.N. Hill, editor Chap. 15, p 306-324, 1963. 2 fig,

Descriptors: *Estuaries, Bays, Inlets(Waterways), Gulfs, Sounds, Circulation, *Stratification, Fjords, *Water circulation. Identifiers: Flushing, Embayments, Kinematics.

An estuary is a semi-enclosed coastal body of and within which the sea-water is measurably diluted with fresh water deriving from land drainage. Traditionally the term 'estuary' has been applied to the lower reaches of a river into which sea-water intrudes and mixes with the fresh water draining seaward from the land. The term has been extended to include bays, inlets, gulfs and sounds into which several rivers empty and in which the mixing of fresh and salt water occurs. A discussion is presented of the circulation patterns which occur in tributary embayments to estuaries, which in regard to the increment of fresh water added within the embayment would not be classified by definition as estuaries, but in which the circulation is definitely related to the esturarine character of the adjacent water body. Many of the concept developed here for estuaries will apply, with certain appropriate modifications, to non-estuarine coastal embayments and even to segments of the coast and of the open ocean. (Sinha-OEIS)

MULTI-DIMENSIONAL ASPECTS OF EDDY DIFFUSION DETERMINED BY DYE DIFFU-SION EXPERIMENTS IN COASTAL WATERS (SUMMARY),

Loyola Univ., Los Angeles, Calif. J. E. Foxworthy, R. B. Tibby, and G. Barsom. In: Symposium on Diffusion in Oceans and Freshwater, Palisades, NY., August 31-September 1, 1964, T. Ichiye, editor, p 71-73, 1964.

Descriptors: *California, Coasts, *Dye dispersion, *Diffusion, *Statistical models, Model models. Identifiers: Nearshore, Eddy diffusion, Wind

Results are presented of a series of experiments on multi-dimensional diffusion conducted in the near shore coastal areas off Southern California. Experiments are described on two- and three-dimenperiments are described on two- and three-dimensional relative diffusion of a patch of dye released from an instantaneous point source. By utilizing a continuous flow type fluorometer and specially designed underway sampling equipment, it was possible to ascertain the average spacetime distribution of fluorescent dye concentration in a diffusing patch. From these data the rates of diffuision (in terms of the mean square dispersion) were determined in the vertical and horizontal coordinate directions. The decrease in maximum dye concentrations with time was proportional to the amount of dye initially released and inversely proportional to the square root of the overall rate of diffusion, as predicted by several statistical models of two- and three-dimensional relative dif-fusion. (Sinha-OEIS) W74-04322

HARMONIC GENERATION OF SHALLOW WATER WAVES OVER TOPOGRAPHY, Flories State Univ., Tallahassee. Geophysical Fluid Dynamics Inst.

For primary bibliographic entry see Field 2E.

THE SOLITARY WAVE, For primary bibliographic entry see Field 8B. W74-04326

MIXING PROCESSES, For primary bibliographic entry see Field 5B. W74-04327

A REVIEW OF OCEANOGRAPHIC VARIA-BLES AND THEIR ANALYSES AND PREDIC-TIONS OVER THE CONTINENTAL SHELF, Fleet Numerical Weather Facility, Monterey,

T. Laevastu, and G. M. Griswold. In: Proceedings U.S. Navy Fifth Symposium, Military Oceanography, Panama City, Florida, May 1-3, 1968, Oceanographer of the Navy, Vol 1, p 17-25, 1968. 1 tab, 4 ref.

Descriptors: *Coasts, Runoff, *Forecasting, Sound waves, Shallow water, Tides, Tidal currents, Winds, Temperature, Salinity, Marine biology, Bathymetry, *Continental shelf, Identifiers: *Sea-air interaction, *Sea-land interac-

The factors and dynamic processes affecting the oceanographic variables in coastal waters are categorized and quantitatively evaluated. Processes in coastal and offshore regions are compared and the magnitudes of changes in environ-mental properties are listed. A quantitative description is given of the coastal sea-air interac-tions and sea-land interactions, including runoff

uons and sea-tand interactions, including runoff problems. General analyses and forecasting models for oceanographic variables in coastal waters are presented, based on the above background knowledge. The sea-bottom interactions and the characteristics of marine biology, in coastal waters are summarized. A brief review of the effects of coastal environment on propagation is also given. (Sinha-OEIS) W74-04329

HURRICANE STORM SURGE CONSIDERED AS A RESONANCE PHENOMENON, Waterloopkundig Laboratorium, Delft (Netherlands).

G. Abraham. In: Proceedings of Seventh Conference on Coastal Engineering, The Hague, Netherlands, August 1960, ASCE, Published by Council, the Engineering Foundation, Vol 2, Chap 31, p 585-602, 1961. 13 ref. NSF 4630.

*Hurricanes, *Storm Descriptors: surge. Seasonance, Model studies, Gravity waves, Waves(Water), *Surges, Coasts, *Tsunamis, *Waves(Water),

A model study was performed of the water gravity waves generated by a circular local disturbance of pressure, advancing with constant velocity over the surface of water of constant depth. The results indicate that under critical conditions a resonance type phenomenon occurs for which the associated wave heights have a maximum value. The resonant conditions may be an important factor for the generation of the surge due to hurricanes that approach the coast perpendicularly. The following conclusions may be drawn: (1) A period of time of the order of magnitude of one hour may be considered to be sufficient for the development of three dimensional shallow-water maxima in na-ture. (2) Assuming that sufficient time is available for their development, three dimensional shallowwater maxima up to three times the static water displacement may be considered to be possible in nature. A shallow-water maximum of three times the static water displacement, combined with total

reflection against the coast, could explain storm surges up to six times the static water displacement. The shallow-water maxima, combined with the affects of the coast could even explain stormsurges higher than six times the static water dis-placement. (Sinha-OEIS) W74-04332

A STUDY OF DIFFUSION IN AN ESTUARY, Navy Hydrographic Office, Washington, D.C. For primary bibliographic entry see Field 5B.

MECHANICAL BYPASSING OF LITTORAL DRIFT AT INLETS,
Corps of Engineers, Washington, D.C. Beach Ero-

sion Roard

Journal of the Waterways and Harbors Division, American Society of Civil Engineers, Vol 88, No WW1, Proceedings Paper 3058, p 83-99, February 1962. 7 fig, 19 ref.

*Coasts, *Sediment *Littoral drift Descriptors: "Coasts, *Sediment *Inlets(Waterways), *Sediment *Coastal structures, Geomorphology. Identifiers: *Sand bypassing, Shoaling. transport,

A brief examination of the general processes of lit-toral drift movement at uncontrolled and con-trolled coastal inlets is presented. The principal factors are noted that should be evaluated when factors are noted that should be evaluated when mechanical bypassing of drift past an inlet is considered. The general techniques of bypassing are examined, and the types of plants used in the operation are described. A summary is given of all completed and active bypassing projects in the United States. Some of the more important factors that need to be considered in the planning of a bypassing evaluation of the more important factors that need to be considered in the planning of a bypassing evaluation of the more important factors. that need to be considered in the planning of a bypassing system are geomorphology, subsurface conditions, water level variations, winds, waves, allowable wave runup and overlapping, shore line and offshore depth changes, littoral drift, the effects of nearby inlets or other structures, prior constructive works and their effects, the zone for collecting the littoral drift and placement of drift downdrift of inlet, availability of materials for construction and maintenance, effective time of operation of bypassing system, and comparative costs. (Sinha-OEIS)

WAVES IN SHOALING WATER, For primary bibliographic entry see Field 8B. W74-04338

SHORES AND SHORE PROCESSES,

R. L. Wiegel.
In: Oceanographical Engineering, Chapter 14, p
341-383, 1964. 37 fig, 101 ref. Prentise Hall, New
York, NY, Price: \$24.75.

Descriptors: Shores, *Beaches, Environment, Sediment, *Sediment transport, *Littoral drift, *Estuaries, *Refraction(Water waves), Waves(Water), Currents(Water), Sedimentation. Identifiers: Diffraction.

Current understandings on shores and shore processes are described. Subjects treated are: classification (genetic) of shores, descriptive clasclassification (geneuic) of snores, descriptive classification, the shore and its environment (factors affecting beach characteristics), description of beach material, beach configuration, source of material, stability of beaches, longshore drift, and estuary entrances. (Sinha-OEIS)
W74-04339

A REFRACTION STUDY AND PROGRAM FOR PERIODIC WAVES APPROACHING A SHORELINE, AND EXTENDING BEYOND THE BREAKING POINT, Delaware Univ., Newark. Coll. of Marine Studies. For primary bibliographic entry see Field 8B.

W74-04340

HURRICANE TIDE PREDICTION FOR NEW YORK BAY, Texas A and M Univ., College Station. Dept. of

Oceanography and Meteorology. B. W. Wilson.

In: Proceedings of Seventh Conference on Coastal Engineering, The Hague, Netherlands, August 1960, ASCE, Published by Council, The Engineering Foundation, Vol 2, Chap 30, p 548-584, 1961. 20 fig, 1 tab, 33 ref. N7 our 48702, N our 2119 (02).

Descriptors: New York, Surges, *Storm surge, *Hurricanes, *Bays, Gravity waves, Forcing function, *Waves(Water), *Tides, Pressure, *Winds. Identifiers: *New York Bay, Edge waves.

The solution is presented of the problem of cor-The solution is presented of the problem of correlating, on a two-dimensional basis, the meteorological parameters of several off-shore storms with the known surge induced by them in New York Bay and with the application of the results to the prediction of likely effects of a design hurricane of given strength traversing a given path at a given speed. A recursion formula is evolved, using the method of finite differences for time increments of 1/3 hour, which relates tide elevation at the bay-mouth with two values of the elevation at 1/3 and 2/3 hour earlier and with values of wind stress and pressure gradient drivenances. values of wind-stress and pressure-gradient driv-ing-force components at times earlier by the periods taken for free long gravity waves to travel from the stations to the bay-mouth. The formula includes a cumulative forcing function term which allows for the geostrophic influence of the earth's rotation and also for an 'edge-wave' effect northward along the eastern seaboard. Moreover it takes into account the observed tendencies of hur-ricane storm tides in New York Bay to develop re-surgences at periods of 7 hours with decay rates of 50% amplitude decrease per cycle. The coeffi-cients of the 'forcing functions', determined by correlation, tend to represent the storm size and speed and also the dynamic augmentation of the specu and also the dynamic augmentation of the forced wave. Predicted maximum storm tide heights are in fair agreement with crude empirical estimates based on central pressures within the hurricanes. (Sinha-OEIS) W74-04343

ESTUARINE CURRENTS AND TIDAL

STREAMS, Imperial Coll. of Science and Technology, London (England). Dept. of Civil Engineering.

R. Agnew.

R. Agnew. In: Proceedings of Seventh Conference on Coastal Engineering, The Hague, Netherlands, August 1960, ASCE, Published by Council, The Engineer-ing Foundation, Vol 2, Chap 28, p 510-535, 1961. 17 fig, 20 ref.

Descriptors: Circulation, *Currents(Water), *Estuaries, *Density currents, *Tidal streams, *Tidal effects, Turbulence, Equations of motion, Density, *Mixing.

Identifiers: Tidal range.

Estuarine processes are analyzed in some detail. In particular, consideration is given to density dis-tribution, mean velocities of circulation, turbulence measurements, equations of motion, velocity distribution in density current, and the effects of the neglected inertia term in the dynamic equation. The case of a tidal estuary, which may be treated as a channel closed at one end and open to the sea at the other end, involves the combinato the sea at the other end, involves the combina-tion of an incident wave whose amplitude decreases exponentially in the direction of propagation (from open to closed end), and a reflected wave whose amplitude decreases ex-ponentially from the closed end to the sea. A general solution is very difficult, but the direction of net movement in a tidal estuary may be inferred from available data on the variation of tidal eleva-tions and mean velocities along the estuary. (Sinha-OEIS)

W74-04344

SEDIMENT MOVEMENT AT INDIAN PORTS. Birla Inst. of Tech., Ranchi (India), Dept. of Civil Engineering. M. Manohar.

In: Proceedings of Seventh Conference on Coastal Engineering, The Hague, Netherlands, August 1960, ASCE, Published by Council, The Engineer-ing Foundation, Vol 1, Chap 21, p 342-374, 1961. 20 fig. 10 ref.

Descriptors: Coasts, *Sediment transport, Ports, Harbors, *Estuaries, *Beaches, Erosion, Deposition(Sediments), *Winds, *Littoral drift, tion(Sediments), *Winds, *Monsoons, Seasonal, Asia. Identifiers: *India, Accretion.

Sediment movement along the east and west coasts of India is described. The information presented should be useful in many countries where investigations of the coastlines are far from adequate. The characteristics of the east and west coast features are different in nature with respect to the wind forces, erosion, accretion, and littoral drift. Special consideration is given to the different wind systems with emphasis on the effects of the monsoons. It is indicated that with each type of coast, engineering works will differ. A study of coastal sediment movement is important since what may be beneficial to a harbor may be harmful for preservation of a coastal strip. Improper use of protective structures may accelerate changes along the shoreline rather than stop them. (Sinha-OEIS) W74-04345

DYNAMICS AND MORPHOLOGY OF SEA

National Science Foundation, Washington, D.C. Special Foreign Currency Science Information

For primary bibliographic entry see Field 2J. W74-04425

SOME RESULTS OF REGIONAL COASTAL IN-VESTIGATIONS IN THE USSR, For primary bibliographic entry see Field 2J.

DEVELOPMENTAL HISTORY AND PRESENT-DAY DYNAMICS OF THE CHUSHKA SPIT, For primary bibliographic entry see Field 2J. W74-04428

SOME DATA ON THE POST-GLACIAL EVOLU-TION OF KARKINIT BAY AND THE ACCUMU-LATION OF BOTTOM SEDIMENTS WITHIN

For primary bibliographic entry see Field 2J. W74-04429

MORPHOLOGY AND EVOLUTION ALAGOON COAST ON SAKHALIN, For primary bibliographic entry see Field 2J. EVOLUTION

CERTAIN ASPECTS OF THE INTERACTION BETWEEN WAVE FLOW AND A DEFORMABLE BOTTOM AT LOW VELOCITIES, For primary bibliographic entry see Field 2J. W74-04435

THE POSSIBILITY OF FORECASTING TRANSIENT COASTAL RELIEF CHANGES BY

For primary bibliographic entry see Field 2J. W74-04436

THE POSSIBILITY OF PREDICTING LONGSHORE CURRENTS IN TIDELESS SEAS, PREDICTING For primary bibliographic entry see Field 2J. W74-04439

THE ROLE OF EOLIAN PROCESSES IN THE DYNAMICS OF A SHALLOW ACCUMULA-TION COAST,
For primary bibliographic entry see Field 2J.
W74-04440

GALVESTON BAY HURRICANE SURGE STUDY: REPORT 2. EFFECTS OF PROPOSED BARRIERS ON TIDES, CURRENTS, SALINITIES, AND DYE DISPERSION FOR NORMAL TIDE CONDITIONS—APPENDIX B: CALIBRA-

Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab. For primary bibliographic entry see Field 8B. W74-04573

WAVES OFF BENGHAZI HARBOUR - LIBYA, Halcrow (William) and Partners, London (England).

(Engiand).
K. Y. Singh, and L. Draper.
In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968. American Society of Civil Engineers, Vol 1, Part 1, Chap 2, p 9-18, 1969. 5 fig, 5 ref.

Descriptors: *Waves(Water), *Harbors, Forecasting, *Measuring instruments, Fetch, Coasts, ing, * Identifiers: *Libya(Benghazi *Recording instruments.

Details are given of the wave studies associated with the reconstruction of Benhazi Harbour, from the early forecasts, the installation of a recording instrument, its failures and repairs, to forecasts instrument, its failures and repairs, to forecasts based on more recent techniques and subsequent analysis and presentation of results of records taken from 1961 to 1965. Although reasonable agreement has been obtained between the waves forecast using the latest techniques and the actual measured records, considerable improvement is needed in both the forecasting and recording techniques. Forecasting would be more accurate if wind speed and its duration over the fetch could be determined with greater accuracy. (Sinha-OEIS) W74-04608 W74-04608

A STUDY ON MASS TRANSPORT IN BOUNDARY LAYERS IN STANDING WAVES, Kyota Univ. (Japan). Disasters Prevention For primary bibliographic entry see Field 2J. W74-04615

APPLICATION OF FLUORESCENT COATED SAND IN LITTORAL DRIFT AND INLET STU-

DIES,
Florida Univ., Gainesville. Dept. of Coastal and
Oceanographic Engineering.
M. Stuiver, and J. A. Purpura.
In: Proceedings of Eleventh Conference on
Coastal Engineering. London. England, Sep-Coastal Engineering, London, England, September 1968. American Society of Civil Engineers, Vol 1, Part 2, Chap 19, p 307-321, 1969. 8 fig, 2 tab.

Descriptors: *Florida, *Littoral drift, *Sediment transport, Coastal structures, *Estuaries, *Inlets(Waterways), Tracers, Beaches, Coastal engineering, Fluorescent dye. Identifiers: *Sand bypassing, West Palm Beach(FL).

Fluorescent coated sand is used in tracing the sand movement along beaches and around inlets. As a part of an extensive beach erosion study along the shore of West Palm Beach, Florida, four areas were subjected to such a tracer study. Each area

Field 2-WATER CYCLE

Group 2L—Estuaries

represented a particular beach configuration either with or without erosion protective structures. The results of a study of the sand migration in and around South Lake Worth Inlet are discussed. It can be concluded that most of the bypassed material originated from the bar region and not from the beach. This means that sediment not only is transported along the bar but also in substantial quanities across the bar. Observations made in the inlet channel show that the sediment carried into met channel show that the sediment carried into the inlet is predominantly a suspended load. Of more significance is the observed transport through the inlet from sediment originating from the south side of the inlet for waves approaching from a northeasterly direction. The negligible amount of sediment transported outward to the ocean makes this inlet an extreme of a sand drain causing a considerable loss of sand from the surrounding beaches as evidenced by these tracer stu-dies. (Sinha - OEIS)

FIELD INVESTIGATION PRACTICES OF COASTAL STUDIES IN JAPAN. Tokyo Univ. (Japan).

M. Hom-ma.

In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, Sep-tember 1968, American Society of Civil Engineers, Vol 2, Part 4, Chap 76, p 1213-1221, 1969. 4 fig.

Descriptors: *Bibliographies, *Coasts, *Coastal engineering. Identifiers: *Japan.

A brief review is presented of publications on field studies carried out in Japanese coasts. Japan has many projects of coastal works in relation to the development of an industrial area, the protection of coastal land from disaster and some other purposes. Before the execution of these projects, the agencies in charge of them make field investigations. The results of investigations are reported in their official publications and sometimes the abstracts of them are reported at the annual meeting of coastal engineering held by the Japan Society of Civil Engineers. As the official publication of the governmental organizations are distributed in strictly limited circles, they are not well known by scientists and engineers outside these organizations. Some of these official reports and some additional reports were selected from the proceedings of annual meetings of coastal engineering, and a classification of the contents and a brief review of them are presented. (Sinha-W74-04625

THE ATLANTIC COAST OF LONG ISLAND. Army Engineer District, New York. For primary bibliographic entry see Field 8A. W74-04626

CONSTITUENT TRANSPORT IN ESTUARIES. Oregon State Univ., Corvallis. Dept. of Civil En-

In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, Sep-tember 1968, American Society of Civil Engineers, Vol 2, Part 4, Chap 86, p 1350-1356, 1969. 2 fig. 4

Descriptors: *Esturaries, *Sediment transport, Diffusion, Mixing, *Bays, *California. Identifiers: *San Francisco Bay(CA).

During the last two decades considerable progress has been made in analyzing the diffusion process in estuaries. Unfortunately, certain difficulties (e.g. prediction of diffusion coefficients) still prevent common application of the diffusion method. An old technique, related to the diffusion concept, can however, frequently give useful information. formation regarding constituent mixing and trans-

port velocities in natural estuaries. The linear characteristic of the one-dimensional mass continuity equation for constituents (conservative or first order decay) in estuaries shows that the constituent residence times or transport velocities are independent of the consitituent source strength. This fact permits computation of representative constituent transport velocities using artificial or natural tracers with typical discharge locations. The evaluation procedure required a minimum of data and labor; e.g. no knowledge of diffusion coefficients. In estuaries and bays with predominantly one-dimensional constituent transport the procedure gives practical information regarding the mixing and exchange mechanism. In Northern and Southern San Francisco Bay dissolved silica (Si02) was found to be a good representative tracer naturally discharged by rivers and streams. (Sinha-OFIS) W74-04627

HYDRAULIC MODEL EXPERIMENT ON THE DUFFUSION DUE TO THE COASTAL CUR-

Univ. (Japan). Disaster; Prevention Research Inst. For primary bibliographic entry see Field 5B. W74-04628

SHEAR VELOCITY IN A TIDAL ESTUARY. Liverpool Univ. (England). Dept. of Civil Engineering.
A. R. Halliwell, and B. A. O'Connor.

In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, Sep-tember 1968, American Society of Civil Engineers, Vol 2, Part 4, Chap 88, p 1377-1396, 1969. 4 fig. 12

Descriptors: *Estuaries, *Tidal effects, *Shear stress, Density.
Identifiers: Mersey River, England, *Shear

velocity, Low slack water, Surface slopes, *Energy slope, Inertia, *Tidal cycle, Kinetic ener-

A study involving the determination of the bed shear stress and thence shear velocity in the Narrows of the River Mersey (a well mixed tidal estuary) is described. The two dimensional equation of motion is examined. In order to determine the energy slope, it is essential to evaluate density, in-ertia and kinetic energy terms as well as surface slopes. Although the density term is much smaller than the other terms it is important at periods of low slack-water. Measurements of the various terms are described and attention is drawn to the difficulties arising in the case of the surface slopes. Comparison is then made between the values of the shear velocity as predicted from the energy slope and those obtained using velocity traverses throughout the depth and with measurements of velocity at three fixed positions near to the bed. Finally consideration is given to the relationship between the cross-sectional mean velocity, the depth-mean velocity at 3 ft above the bed and the shear velocity obtained from the energy slope. There is good linear correlation of each of these velocities with the shear velocities these velocities with the shear velocity throughout the tidal cycle except for the period around low slack-water. (Sinha-OEIS) W74-04629

BUOYANCY SPREAD OF WASTE WATER IN COASTAL REGIONS, Vattenbyggnadsbyran Ltd., Stockholm (Sweden).

For primary bibliographic entry see Field 5B.

USE OF A COMPUTATIONAL MODEL FOR TWO-DIMENSIONAL TIDAL FLOW, RAND Corp., Santa Monica, Calif. J. J. Leendertse.

In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968, American Society of Civil Engineers, Vol 2, Part 4, Chap 90, p 1403-1420, 1969, 8 fig. 3

Descriptors: *Hydraulic models. *Shallow water. "Tidal effects, "Estuaries, Coasts, "Currents(Water), "Wave propagation, Equations. Identifiers: Tidal flow, Bottom friction, Dif-ferential equations, Numerical integration.

A new approach is given to the solution of two-dimensional tidal flow in shallow water. It has been shown that the propagation of long waves in coastal waters can be studied successfully by use of a numerical integration method. The multioperation method developed is characteristic of implicit methods; namely, there is no upper limit on the time step for stability reasons, as is the case with explicit methods. The multi-operation method allows a direct and rapid solution of all velocities and water levels on each time level. The multioperational method described is particularly suitable for long-wave computation in coastal waters, where water movements are introduced by changes in the water level (or currents) along the sides of the model and where the effect of bottom friction is larger than the effects of lateral eddy viscosity, which is neglected. The contribution of the convective-inertia terms in the equation of motion is assumed to be small compared to that of other terms. These terms are represented with a lower order of accuracy. The detailed description of computational procedures permits an expedient introduction of geographic features such as water depth, boundaries, and characteristics of bottom roughness for the modeling of wave propagation. W74-04631

FEEDING OF JUVENILE CARP CYPRINUS CARPIO L. IN THE ARAKUM BODIES OF WATER (DELTA OF THE TEREK RIVER) AT EARLY DEVELOPMENTAL STAGES, (IN RUS-

SIAN), Kaspiiskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Makhachkala (USSR).

K. A. Adzhimuradov. Vopr Ikhtiol. Vol 12, No 6, p 1079-1972.

Identifiers: *Carp feeding, *Chironomidae, *Cladocera, *Copepoda, Cyprinus-carpio, Deltas, Identifiers: Insects, Juveniles, Mosquitoes, Ostracoda, Rivers, Rotifers, *USSR(Terek River delta), *Growth stages, Fish diets.

Juvenile carp change to exogenous feeding at the first larval state of development, while still having remains of the yolk sac. At this stage it consumes small organisms (rotifers and nauplius stages of Copepoda). At the second and third larval stages of development the main food objects are the copepodid stages of Copepoda, Cladocera, and rotifers. At subsequent larval stages Copepoda predominated over other groups of food organ-isms, which corresponded to their content in plankton. At the first fry stage the carp changes to feeding at the bottom, detritus appears in his food, and the number of benthic organisms increases (larvae of Chironomidae, Ostracoda, and larvae of mosquitoes and other insects).--Copyright 1973, Biological Abstracts, Inc.

THE APPLICATION OF NUMERICAL SIMULATION MODELS IN THE ASSESSMENT OF THE EFFECT OF DISCHARGES INTO COASTAL WATERS.

RAND Corp., Santa Monica, Calif. For primary bibliographic entry see Field 5B. W74-04674

FEASIBILITY STUDY FOR A SURGE-ACTION MODEL OF MONTEREY HARBOR, CALIFOR-

Science Engineering Associates, Inc., San Marino,

B. W. Wilson, J. A. Hendrickson, and R. E. Kilmer

Available from NTIS as AD-684 953 for \$6.00 paper copy, \$1.45 microfiche. Prepared for Army Engineer Waterways Experiment Station. Contract Report No 2-136, October 1965. 206 p, 74 fig, 11 tab, 45 ref. DA-22-079-CIVENG-65-10.

Descriptors: *California, Model studies, *Harbors, *Waves(Water), *Bays, *Coasts, Numerical analysis, Refraction(Water waves), *Surges, Cyclones, *Climate, Winds.
Identifiers: Monterey(CA), Sea and swell, Oscillations Monterey Canyon, Long neriod waves, Taltions, Monterey Canyon, Long period waves, Tal-weg, Standing waves, Surf-beats, Wave propaga-

The feasibility is shown of reproducing in an en-gineering model the surge phenomenon that at various times occurs in Monterey Harbor, Califorvarious times occurs in monercy fractor, camor-nia. Wind and wave climate prevailing in and near Monterey Bay is described. Sea and swell data summarized for the deep-water vicinity-area and for Monterey Bay itself. Monterey Harbor tends to be quite well protected from the longer period swells. Statistical data for the occurrence of longperiod waves at three sensor positions are examined and compared with similar-type data for Santa Cruz Harbor and for Half Moon Bay Harbor. The oscillating characteristics of Monterey Bay are examined. A detailed study is made of the manner of propagation of long period waves into Monterey Bay. Attention is given to the question whether the surge phenomenon in Monterey Har-bor is the consequence of surf-beats or of genuine long-period waves. (Sinha-OEIS) W74-04721

REPRODUCTION OF ESTUARINE STRUC-TURE AND CURRENT OBSERVATION
TECHNIQUES IN THE HECATE MODEL,
Fisheries Research Board of Canada, Namaimo
(British Colombia). Pacific Oceanographic Group.

Manuscript Report Series (Oceanographic and Limnological) No 158, October 18, 1963. 24 p, 13 fig, 1 tab, 10 ref.

*Model studies, *Estuaries Descriptors: *Currents (Water), *Mixing, *Internal waves.
Identifiers: *Canada(Queen Charlotte Sound),
Flushing, Subsurface currents, Halocline, *Hecate model.

The Hecate Model is a physical analogue of the Dixon Entrance - Hecate Strait - Queen Charlotte Sound region. Preliminary experiments established a realistic structure in the model with which true oceanographic experiments can be perwhich true oceanographic experiments can be per-formed. Methods of making current measurements were demonstrated. In the estuarine system the following were considered: water structure and transport, flushing, the two-layer system, mixing, the halocline, and internal waves. Current obser-vations are concerned with both surface and sub-surface currents. (Sinha-OEIS)

SEDIMENTATION IN HAWKE BAY, Department of Scientific and Industrial Research, Wellington (New Zealand). Oceanographic Inst.

H. M. Pantin. New Zealand Department of Scientific and Indusrical Research Bulletin 171, New Zealand Oceano-graphic Institute Memoir No 28, 1966. 70 p, 14 fig, 11 tab, 23 ref, 4 plates, 1 map.

*Sedimentation, *Bathymetry, Descriptors: Coasts, *Sediments.
Identifiers: *New Zealand(Hawke Bay), Identifiers: *New Authigenic minerals, Glauconite, Sedimentary structures, Limonite.

Hawke Bay is a conspicuous re-entrant on the east coast of the North Island, New Zealand, measuring some 50 miles from north-east to south-west and extending about 25 miles inwards from the general line of the coast. The surface sediments in Hawke Bay are divided into five groups; offshore gravel zones, sand belt, mud belt, central zone, and sediments associated with the Lachlan Ridge The sand belt separates the mud belt from the shoreline and the distribution of these two zones appears to be governed by present-day sedimenta-tion. The central zone and parts of the Lachlan Ridge are at present non-sedimentation areas.

Other parts of the Lachlan Ridge are areas of slow sedimentation. Yellowish pumice infillings, which occur in the central zone and on parts of the Lachlan Ridge, apparently owe their color to primary authigenic limonite. Secondary authigenic limonite, formed by the oxidation of glauconite, is found in the same areas as the latter mineral. -OEIS) (Sinha-OEI W74-04726

SELECTED BIBLIOGRAPHY ON BEACH FEA-TURES AND PROCESSES. RELATED NEARSHORE

Louisiana State Univ., Baton Rouge. Coastal Studies Inst.

For primary bibliographic entry see Field 2J. W74-04728

INSHORE SEA SURFACE TEMPERATURE AND SALINITY CONDITIONS AT AGATE BEACH, YAQUINA BAY AND WHALE COVE, OREGON, IN 1970, Oregon State Univ., Corvallis. Dept. of Oceanog-

raphy. J. J. Gonor, A. B. Thum, and D. W. Elvin. Available from NTIS as AD-717 068 for \$3.00 paper copy, \$1.45 microfiche. Data Report No. 45, Reference 70-44, November 1970. 30 p, 5 fig, 5 tab. ONR-N00014-67-A-0369-0001.

Descriptors: *Surf, *Oregon, *Salinity, Temperature, Topography, Hydrography, Bays, Descriptors:

Identifiers: Agate Beach(OR), Yaquina Bay(OR), Whale Cove(OR).

Daily temperature and salinity conditions measured in the surf at Agate Beach, Oregon, are given and summarized by 15 day periods, with the range, mean and standard deviation of each period indicated. Conditions in 1970 are briefly compared to those observed in 1968 and 1969. Water and near surface air temperatures at a station 3 miles inside Yaquina Bay measured at the daily four tidal extremes are tabulated. A system for continuously recording temperature from a thermistor chain installed in the intertidal is described. The design and construction of thermistor pressure cases, thermistor shielding, and dual range Wheat-stone Bridge are described. Data recorded from intertidal thermistor chain installed at Whale Cove, Oregon, at the four daily tidal extremes are given. These data are compared to those from Agate Beach, 10 miles away, and it is concluded that there is poor correlation between the two locations due to hydrographic and topographic differences. (Sinha-OEIS)

AN ANNOTATED BIBLIOGRAPHY OF FLUSH-ING AND DISPERSION IN TIDAL WATERS, Navy Hydrographic Office, Washington, D. C.

Special Publication, H.O. SP-33, January 1960. 34

*Dispersion, Descriptors: Coasts. Perculation, *Tides, *Currens... *Estuaries, *Bibliographies, Salinity, Oceanog. *Currents(Water), *Estuaries, *Bibli raphy, Hydraulics. Identifiers: Nearshore processes, Flushing,

This bibliography of 126 abstracts represents a survey of the scientific literature in the fields of hydraulics, hydrology, and oceanography. The references are annotated for their application to flushing and dispersion in estuaries and the nearshore environment. The value of this bibliography is in its selection of papers of considerable importance to understanding of all coastal and nearshore processes. (Sinha-OEIS) W74-04731

RESEARCH IN THE COASTAL AND OCEANIC ENVIRONMENT. A SUMMARY OF RESEARCH ACCOMPLISHED UNDER PROJECT THEMIS, Delaware Univ., Newark.

W S Gaither Available from NTIS as AD-714 853 for \$3.00 paper copy, \$1.45 microfiche. Annual Status Report No CMS-3MD028, October 1970. 32 p, 14 fig, 3 ref.

Descriptors: *Beaches, *Waves(Water), *Coasts, Marine geology, Remote sensing, *Sediment transport, Meteorology, *Currents(Water), Shallow water.

Progress during the first year of a multidisciplinary study of the coastal environment of a section of the Atlantic Sea Coast (Delaware and adjacent New Jersey and Maryland areas) is summarized. Included are field, laboratory, and theoretical investigations of sedimentary processes, coastal vegetation, tidal marsh soils, wave action and at-tenuation, air-sea interactions, geological history and marine biology. Correlation of ground observations with high altitude photographic imagery to provide a useful method for the remote characterization of such coastal regions is an important objective. (Sinha-OEIS)
W74-04732

NEW DIMENSIONS IN ESTUARY CLASSIFICA-TION.

Washington Univ., Seattle. Dept. of Oceanog-

raphy. D. V. Hansen, and M. Rattray, Jr. Limnology and Oceanology, Vol 11, No 3, p 319-326, July 1966. 4 fig, 15 ref.

Descriptors: *Estuaries, *Circulation, *Stratification, *Salt balance, *Salinity, Classification, Tides, River flow, Geomorphology, Identifiers: Tidal currents.

Results of recent theoretical studies are used as a basis for a new two-parameter system of estuarine classification. The classes are delineated by the magnitudes of the relative stratification and circulation parameters associated with changes in the salt balance mechanism. The theoretical results depend on a knowledge of the eddy coefficients of viscosity and diffusivity. Tentative relationships between these coefficients and the bulk parame-ters of tidal current, river flow, and geomorphology, which are obtained from experimental data, may be used to determine the salinity and net current distributions in partially mixed and well-mixed coastal plain estuaries. (Sinha-OEIS)

AN APPROXIMATION OF THE WAVE RUN-UP

FREQUENCY DISTRIBUTION, Corps of Engineers, Washington, D.C. Beach Erosion Board. T. Saville, Jr.

In: Proceedings of Eighth Conference on Coastal Engineering, Mexico City, November 1962, American Society of Civil Engineers, Part 1, Chap 4, p 48-59, 1963. 5 fig, 1 tab, 6 ref.

Descriptors: *Waves(Water), *Frequency analy-Identifiers: *Wave run-up, Wave steepness, Overtopping.

Field 2-WATER CYCLE

Group 2L—Estuaries

The distribution of wave steepness for fully developed sea is obtained from Bretschneider's joint distribution of wave height and wave period. This steepness distribution is used with standard wave run-up curves to develop a frequency curve of wave run-up. Use of this run-up distribution curve will permit more accurate estimation of the variability in wave run-up for design cases, and particularly the percent of time in which run-ups will exceed that predicted for the significant wave. The distribution may also be used with normal overtopping procedures to determine more accurate estimates of overtopping quantities. (Sinha-W74-04740

TRANSFORMATION, BREAKING AND RUN-UP OF A LONG WAVE OF FINITE HEIGHT, Hokkaido Univ., Sapporo (Japan). Dept. of Engineering Science. T. Kishi.

In: Proceedings of Eighth Conference on Coastal Engineering, Mexico City, November 1962, American Society of Civil Engineers, Part 1, Chap 5, p 60-76, 1963. 11 fig, 5 ref.

Descriptors: *Waves(Water), *Beaches, Profiles, Slopes, Shallow water.

Identifiers: *Long waves, Wave transformation, *Breaking waves, *Wave run-up, Shoaling.

In studying the transformation, breaking and runup of a relatively steep wave of a short period, the theory for waves of permanent type has given many fruitful results. However, the theory gradually loses its applicability as a wave becomes flat, since considerable deformation of the wave profile is inevitable in its propagation. A discussion concerning the transformation of a long wave in a channel of variable section is presented based on the non-linear shallow water theory. Further, some brief consideration is given to the effects of bottom friction on wave transformation. Breaking of a long wave is discussed. Breaking on a uniformly sloping beach and on a beach of parabolic profile is considered and the effects of beach profile on breaking are clarified. Experimental results on wave run-up over a 1/30 slope are described. (Sinha - OEIS) W74-04741

ON NON-SATURATED BREAKERS AND THE WAVE RUN-UP,

National Engineering Science Co., Washington, D.C.

B. Le Mehaute.

In: Proceedings of Eighth Conference on Coastal Engineering, Mexico City, November 1962, American Society of Civil Engineers, Part 1, Chap 6, p 77-92, 1963. 4 fig, 7 ref.

*Gravity *Beaches. Descriptors: waves. *Waves(Water), Energy, Slopes. Identifiers: *Breaking waves, *Wave run-up, Path curvature

Some theoretical results pertaining to the physical behavior of gravity waves on a sloped plane are presented. The notion of 'saturated' breakers and non-saturated' breakers which follow the breaking index curve is introduced. Criteria for different kinds of breaking and successive breaking of waves are presented. Some considerations on the wave run-up are deduced. Then a critical analysis of the method of characteristics is presented, with some possible refinements. Path curvature effect is taken into account and the problem of waves climbing on a dry bed is solved. Criteria for deter-mining saturated and non-saturated breakers and the wave run-up by the method of characteristics are proposed. (Sinha - OEIS)
W74-04742 EFFECT OF ENTRANCE ON SEICHE MOTION IN OCEAN PORTS, Indian Inst. of Tech., Kharagpur. Dept. of Civil

Engineering.

In: Proceedings of Eighth Conference on Coastal Engineering, Mexico City, November 1962, American Society of Civil Engineers, Part 1, Chap 7, p 93-113, 1963. 3 fig, 2 tab, 11 ref.

Descriptors: *Waves(Water), *Seiches, *Harbors, Coasts, Model studies, *Ports, Resonnance. Identifiers: Standing waves.

The seiche motion induced in a partially open har-bor is uniquely determined by the standing wave pattern formed in the outside ocean. The variable location and size of the coupling makes the problem essentially three-dimensional. Existing potential theory has been extended, for the case of a simple rectangular port, to simulate ocean condia simple rectangular port, to simulate ocean containions by approximating the open ocean by another rectangular basin of large size. The theoretical problem then reduces to solving the Neuman problem for the two-dimensional Helmholtz equations. tion for a polygonal contour. The finite dimensional approximation of an infinite domain is, however, unsatisfactory at least from the analytical point of view. This difficulty has been removed by using elliptic-cylindrical co-ordinates for the by using emplace/mindrical co-ordinates for the semi-infinite domain in which the perturbation potential has been expanded in terms of periodic Mathieu functions. These theoretical developments have been verified by a series of numerical calculations and experimental studies. (Sinha—ORIC) OFIS) W74-04743

INVESTIGATION OF SEICHE ACTIVITY IN

WEST COAST HARBORS,
Texas Univ., Austin. Defense Research Lab.
G. E. Ellis, and J. L. Collins.

In: Proceedings of Eighth Conference on Coastal Engineering, Mexico City, November 1962, Amer-ican Society of Civil Engineers, Part 1, Chap 8, p 114-126, 1963. 8 fig. 3 tab, 14 ref.

Descriptors: *Seiches, *Harbors, Instruments, "Waves(Water), "California.
Identifiers: San Diego Bay(CA), Long Beach Harbor(CA), "Power spectra, Solion infrasonic hydrophone, "Bottom pressure.

The seiche activity in several West Coast harbors has been investigated. This investigation has been oriented mainly as an experimental problem in which a new oceanographic instrument, the solion infrasonic hydrophone is used to detect bottom pressure fluctuations over a range of 5 sec to 1800 sec periods. A limited theoretical consideration of this problem is presented in an attempt to correlate the seiche phenomenon to the harbor geometry. The data presented are for San Diego Bay and Long Beach Harbor. These data were recorded on magnetic tape and returned to the laboratory for analysis. This analysis consists of prewhitening the data with bandpass filters and then computing the data with bandpass inters and their companing the power spectra by the method of Blackman and Tukey. A short discussion is presented to relate the use of this type of data to the study of two harbor engineering problems, ship mooring and close quarter navigation. (Sinha - OEIS) W74-04744

THE ANALYSIS OF HARBOR AND ESTUARY

SYSTEMS, California Univ., Berkeley. Coll. of Engineering.

J. A. Harder.

In: Proceedings of Eighth Conference on Coastal Engineering, Mexico City, November 1962, American Society of Civil Engineers, Part 1, Chap 9, p 127-135, 1963. 5 fig, 9 ref.

Descriptors: *Estuaries, *Harbors, *Mathematical models, *Analog models, Hydraulic models. Identifiers: Geometry.

Harbor and estuary systems are usually associated with complex geometry, and thus we ordinarily cannot depend on mathematics to give general solutions. Instead of solving the hydraulic equations of flow in the complex geometry, the geometry is reconstructed of the prototype in a reduced scale, by means of models, and by assuming that the equations governing the full-size and reduced-scale systems are the same, to find specific solutions through direct measurements in the latter. (Sinha - OEIS) W74-04745

FLUME EXPERIMENTS ON SAND TRANS-PORT BY WAVES AND CURRENTS, Scripps Institution of Oceanography, La Jolla,

Calif

D. L. Inman, and A. J. Bowen.
In: Proceedings of Eighth Conference on Coastal
Engineering, Mexico City, November 1962, American Society of Civil Engineers, Part 2, Chap 11, p 137-150, 1963. 9 fig, 3 tab, 9 ref.

Descriptors: *Sediment transport. *Waves(Water), *Currents(Water), vater, Coasts, *Beaches. Identifiers: Nearshore processes. Wave height.

Measurements were made of the sand transport (solid discharge) caused by waves and currents traveling over a horizontal sand bed in water 50 cm deep. The waves had heights of 15 cm, and periods of 1.4 and 2.0 sec. The sand transport was measured first in the presence of waves only, then in the presence of waves superimposed on currents. The currents flowed in the direction of wave travel, with steady uniform velocities of 2, 4, and 6 cm/sec. Since sand moves to and fro under the influence of waves, sand traps were placed flush with the surface at either end of the bed. The net sand transport was determined by subtracting the amount of sand trapped at the downwave end. The amount of sand caught in both traps was greatest with waves of 2.0 sec period, while the net sand transport was greatest with waves of 1.4 sec period. Super position of waves on currents of 2 cm/sec produced a two-fold increase in the sand transport for both wave types. Surprisingly, faster currents of 4 and 6 cm/sec caused the discharge to decrease somewhat. Estimates of the power ex-pended by waves was obtained from the decre-ment in wave height as the wave traveled over the ment in wave neight as the wave traveled over the sand bed. Certain calculations show that about one tenth of the total power expended by the waves was used in transporting sediment. (Sinha - OEIS) W74-04746

SUSPENDED SEDIMENT DUE TO WAVE AC-

Tokyo Univ., (Japan). Dept. of Civil Engineering. For primary bibliographic entry see Field 2J. W74-04747

LABORATORY STUDY OF SCALE EFFECTS IN TWO-DIMENSIONAL BEACH PROCESSES,

Kyoto Univ., (Japan). Disaster Research Inst. Y. Iwagaki.

I. Iwagasi. In: Proceedings of Eighth Conference on Coastal Engineering, Mexico City, November 1962, Amer-ican Society of Civil Engineers, Part 2, Chap 14, p 194-210, 1963. 14 fig, 1 ab, 18 ref.

Descriptors: *Beaches, *Waves(Water), *Particle size, *Sand bars, Profiles, *Shallow water, Coasts. Identifiers: Scale effects, *Wave steepness, *Wave height, Breaking waves.

Laboratory tests on two-dimensional beach processes indicate that these procedures are influenced by the deep-water wave steepness, scale of waves and sand size. The influence of sand sizes on the beach process is not remarkable when the deep-water wave steepness is smaller than approximately 0.01 and, in addition, the ratio of the

wave height to the sand size is smaller than a certain value for each wave steepness. Equilibrium beach profiles are also influenced not only by the deep-water wave steepness but by the wave height and the sand size. The limitation between the normal beach and the storm beach, which is a criterion for generation of longshore bars, can be expressed by the deep-water wave steepness and the ratio of the wave height and the sand size. The crest inclination angle of breaking waves ap-proaches a certain value for each deep-water wave steepness with the formation of the equilibrium beach profile independently of an initial beach This value of the angle agrees fairly with that of breaking waves on the fixed bed of the critical beach slope based on the limitation between spilling breakers and plunging breakers when the deep-water wave steepness is 0.04. (Sinha-OEIS) W74-04748

LONGSHORE CURRENTS IN ONE AND MULTI-BAR PROFILES RELATION TO LITTORAL DRIFT,

Florida Univ., Gainesville. Coastal Engineering Lab.

In: Proceedings of Eighth Conference on Coastal Engineering, Mexico City, November 1962, American Society of Civil Engineers, Part 2, Chap 15, p 211-247, 1963. 8 fig, 10 tab, 34 ref.

Descriptors: *Littoral drift, *Waves(Water), *Currents(Water), *Beaches, Slopes, Profiles, *Rip currents, Sand bars. Identifiers: *Longshore currents, Breaking waves,

Bottom friction, Continuity principle, Undertow.

Longshore current theories are discussed. A brief review is presented of wave theories for breaking waves including theoretical, laboratory and field results. The longshore current theory based on the momentum inflow over a uniformly sloping beach and bottom is discussed with special reference to its friction factor. Two new longshore current theories - both based on the continuity principle are described. One of them called the rip current approach assumes that all water thrown in by wave breaking runs out in rip currents and will probably be valid for profiles with well developed bars and waves approaching the shore almost per-pendicularly. The other theory considers the fact that water from a wave breaking under an angle with the bar flows in with a certain phase difference in time longshore and this will create a longshore slope of the average water table, there-fore also a longshore current. The water may return to sea uniformly as undertow or in rip currents or by a combination of both. This theory is particularly valid for waves breaking under a certain, not too small, angle with the bar. In both cases the momentum in the breaking waves is ignored because field observations show that in a well developed bar profile most of the momentum has disappeared inside the bar after wave break-ing (Sinha - OEIS) W74-04749

RHYTHMIC PATTERN OF LONGSHORE BARS SEDIMENT TO TERISTICS.

Tokyo Univ. (Japan). Dept. of Civil Engineering. For primary bibliographic entry see Field 2J. W74-04750

LABORATORY APPLICATIONS RADIOISOTOPIC TRACERS TO FOLLOW BEACH SEDIMENTS, Corps of Engineers, Washington, D.C. Beach Ero-

sion Board.

For primary bibliographic entry see Field 2J. W74-04751

A STUDY OF CRITICAL DEPTH AND MODE OF SAND MOVEMENT USING RADIOACTIVE GLASS SAND, Ministry of Transportation, Yokosuka (Japan).

Port and Harbour Research Inst.
For primary bibliographic entry see Field 2J. W74-04752

TRACING COASTAL SEDIMENT MOVEMENT BY NATURALLY RADIOACTIVE MINERALS, California Univ., Berkeley. Coll. of Engineering. For primary bibliographic entry see Field 21.

SOME CHARACTERISTICS OF THE DUTCH

COAST, Rijkswaterstaat-Deltadienst, (Netherlands). Coastal Research Dept. For primary bibliographic entry see Field 2J. W74-04754

WAVES AND TIDES NEAR THE SHORE,

H. Jeffreys.
Geophysical Journal of the Royal Astronomical
Society, Vol 16, No 3, p 253-257, October 1968. 12

Descriptors: *Gravity waves, *Shores, *Slopes, *Waves(Water), *Tides, Coasts.
Identifiers: *Bottom friction, Tidal waves, Identifiers: Nearshore, Breaking waves

A simplified method is used to give an asymptotic approximation to the behavior of a gravity wave approaching a sloping shore. It indicates that the first serious departure from the linear behavior is due to the rise in importance of the term in a/k(2)h(3). The dissipation in ordinary cases appears to be mainly due to breaking and not to bottom friction. The principle is applied to the superposition of tidal waves on ordinary sea waves. It appears that breakers can account for the largeness of tidal friction in the ocean, and a modified boundary condition in tidal theory is proposed. (Sinha-OEIS) W74-04758

NUMERICAL COMPUTATIONS OF STORM SURGES WITH BOTTOM STRESS,

ESSA Inst. for Oceanography, Rockville, Md. C. P. Jelesnianski.

C. P. Jelesmanski. Monthly Weather Review, Vol 95, No 11, p 740-756, November 1967. 24 fig, 20 ref, 3 append.

Descriptors: Coasts, *Storm surge, Storms, *Waves(Water), Mathematical models, Descriptors. Wathernatical Waves(Water), Mathematical Expressions, Weather forecasting, Equations, *Forecasting, New Jersey Identifiers: Eddy viscosity, *Bottom slip currents,

Wind waves, Tropical storms, Landfalling storms, *Bottom stress, Alantic City(NJ).

The storm surge prediction problem is concerned with the rise of coastal waters brought about by meteorological storms. The rising waters not only inundate coastal areas but also act as a pathway for short surface or wind waves to move and break farther inland. The mechanics and prediction of storm surges are discussed. A linear form of the transport equations of motion is used to compute numerically storm surges generated by model tropical storms traveling across model basins. The storms move in any fixed direction and speed rela-tive to a straight line coast and have a restricted number of physical parameters to fix their strength and size. These parameters are readily available in most weather stations. A dissipating mechanism, introduced by Platzman, using only an eddy viscosity coefficient is modified to include a bottom slip current by means of a bottom slip coefficient. These two coefficients are used to control the amplitude of resurgences on the sea following the passage of tropical storms. Numerical values for the coefficients are empirically determined by

comparing computed and observed resurgences off Atlantic City. Nomograms prepared from the computations may help in forecasting future storm surges. (Sinha - OEIS)

APPROXIMATE ESTIMATIONS OF CORRELA-TION COEFFICIENT BETWEEN WAVE HEIGHT AND PERIOD OF SHALLOW WATER

Ministry of Transportation, Yokosuka, (Japan). Port and Harbour Research Inst.

In: Proceedings of Eighth Conference on Coastal Engineering Mexico City, November 1962, American Society of Civil Engineers, Part 1, Chap 1, p 1-16, 1963. 5 fig, 6 ref.

Descriptors: *Shallow water, *Waves(Water), *Winds, Energy, *Fetch.
Identifiers: Wind waves, Correlation coefficient, Water depth, Deep water waves

The equation is derived for the correlation coefficient as a function of fetch on the assumption that the classical energy equation for the significant the classical energy equation for the significant wave is applicable to the individual wave in a complex sea. Using the same method the correlation coefficient for shallow water waves is estimated as a function of fetch and non-dimensional depth. Also considered is the development of shallow water wind waves and an energy equation for these waves. (Sinha-OEIS) W74-04761

MODIFICATION OF WAVE SPECTRA ON THE CONTINENTAL SHELF AND IN THE SURF ZONE, National Engineering Science Co., Washington,

D.C.
C. L. Bretschneider.

In: Proceedings of Eighth Conference on Coastal Engineering, Mexico City, November 1962, Amer-ican Society of Civil Engineers, Part 1, Chap 2, p 17-33, 1963. 7 fig, 32 ref.

Descriptors: Waves(Water), *Shallow water, *Continental shelf, Continental slope, Coasts, *Percolation, *Refraction(Water waves), Ocean

Identifiers: *Bottom friction, *Wave spectra, Breaking waves, Wind waves, Wave height, Wave period, Surf zone.

The modification of the wave spectrum over the continental shelf is discussed. Modification factors include bottom friction, percolation, refraction, breaking waves, ocean currents, and regeneration of wind waves in shallow water, among other factors. The case for a steep con-tinental shelf with parallel bottom contours and wave crests parallel to the coast and for which bottom friction is neglected was investigated. For this case it is found that the predominant period shifts toward longer periods. The case for a gentle con-tinental shelf with parallel bottom contours and wave crests parallel to the coast and for which bottom friction is important has also been in-vestigated. It is found that the predominant period shifts toward shorter periods as the water depth decreases. The implication is that the significant periods observed in the shallow water over the continental shelf are shorter than those which would be observed beyond the continental slope. In very shallow water, because shoaling becomes important, a secondary peak appears at higher periods. In very shallow water the most probable maximum breaking wave which first occurs would be governed by the breaking depth criteria, whereas in deeper water wave steepness can also be a governing factor. In very shallow water the period of the most probable maximum breaking wave should be longer than the significant period; and for deeper water the period of the most ble maximum breaking wave can be less than the significant period. (Sinha-OEIS) W74-04762

Field 2-WATER CYCLE

695-755, 1963. 28 fig, 2 tab, 7 ref.

Group 2L—Estuaries

PHENOMENA AFFECTING IMPROVEMENT OF THE LOWER COLUMBIA ESTUARY AND ENTRANCE.

Corps of Engineers, Portland, Oreg. Special Projects Investigation Section. J. B. Lockett.

In: Proceedings of Eighth Conference on Coastal Engineering, Mexico City, November 1962, Amer-ican Society of Civil Engineers, Part 4, Chap 40, p

Descriptors: *Estuaries, *Tidal effects, *Saline water intrusion, *Beach erosion, *Sediment transport, Erosion, Hydraulic models, Reservoirs, *Columbia River, *Littoral drift. Identifiers: Littoral currents, Shoaling.

Work undertaken to improve the lower Columbia Estuary and Entrance for navigation is described, and past concepts of phenomena controlling the regimen of this area are discussed. Recent adregimen of this area are discussed. Recent as wances in technology have given rise to a new concept of tidal hydraulic phenomena which emphasizes the relation of salinity intrusion and littoral movement to the degree of shoaling experienced in estuarine areas. The findings of prototype measurements undertaken in 1959 along the lower Columbia, and other endeavors to expand the knowledge of controlling phenomena, including, statistical wave studies, analyses of offshore changes, studies of attrition and accretion of adjacent shorelines, and comprehensive investigations of the distribution of Columbia River sediments are reviewed in the light of this new concept. Authorization, construction and verifica-tion of the comprehensive lower Columbia Estuary hydraulic model are discussed, as well as tests proposed for identification of controlling phenomena and for development of the most effective and economical plan of improvement. Finally, the extent of present knowledge is sum-marized and considerations are outlined for the future under conditions of controlled upland discharge resulting from contemplated headwater reservoir operation. (Sinha-OEIS) W74-04763

COASTAL-WATER VEGETATION OF THE LOWER REACHES OF THE DNESTR (IN RUS-

SIAN), N. V. Smirnova-Garaeva.

Izv Akad Nauk Mold SSR Ser Biol Khim Nauk. 2.

p 18-24, 1972, Illus. Identifiers: *Coastal vegetation, *Estuaries, Fish-Navigation, Phragmites-communis, Rivers, Salvinia-natans, Scirpus-lacustris, Stratiotes-aloides, Swamp, Typha-angustifolia, Typha-latifolia, *USSR(Dnestr River), Utricularia-vul-garis, Vallisneria-spiralis, *Vegetation(Coastal),

In order to characterize the vegetation, the lower Dnestr (USSR) was divided into 3 regions: sandy-clayey-steep banked; clayey-floodplain; estuarineplain. Species growing in each region are enu-merated. Vegetation in the swampy territory of the lower Dnestr was classified in 2 groups of plant indicators: plants of the initial stage of swamp formation (e.g., Phragmites communis Trin., Typha angustifolia L., T. latifolia L., Scirpus lacustris L.0 and plants of progressive swamp formation (e.g., Salvinia natans L. All., Utricularia vulgaris L., Vallisneria spiralis L., Stratiotes aloides L.). It is concluded that progressive swamp formation is the rule in the lower Dnestr. It is economically important to progressive swamp formation is portant to preserve navigation on the Dnestr, fish-ing of its lakes and preservation of the Kuchurgan-skii estuary. The use of vegetation indicators facilitates development of measures for com-batting swamp formation and overgrowth of the Dnestr and its reservoirs by water vegetation.— Copyright 1973, Biological Abstracts, Inc. W74-04813

PROPAGATION OF A FINITE-AMPLITUDE SURFACE WAVE WITH ALLOWANCE FOR

RANDOM IRREGULARITIES OF THE BOT-

Nauchno-Issledovatelskii Radiofizicheskii Institut, Gorkii (USSR). For primary bibliographic entry see Field 2J. W74-04841

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

WATER CLEANING TREATMENT, Raypak Co. Inc., Westlake Village. Calif (Assignee).

U.S. Patent No. 3,776,842 3 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 917, No 1, p 286, December 4, 1973.

Descriptors: *Patents, *Alkaline earth metals, Bacteria, Organic matter, Detergents, *Water treatment. *Membranes. *Demineralization. Separation techniques, Desalination.

Identifiers: *Cellulose acetate membrane, Dis-

Clean water is produced by pressure passage of the water through a membrane which rejects or prevents passage of impurities such as dissolved minerals, detergents, organic material, bacteria and other pollutants. The pH of the feed water is reduced to below 7.0 by dividing the feed water stream and contacting a portion of it with a cation exchange media to substitute hydrogen ions for the alkaline earth metals and then recombining the portions of the feed water stream. The feed water is passed under pressure over one side of the cellulose acetate membrane with removal of cle water from the opposite side of it. (Sinha-OEIS) W74-04710

SOLAR DISTILLATION APPARATUS,

U.S. Patent No. 3,775,257, 3 p, 4 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 916, No 4, p 1481, November 27, 1973.

Descriptors: *Patents, *Solar distillation, *Desalination, Sea water, Fresh water, Equipment, Condensation.

A curved dome formed of sheets of transparent material defines the top closure of a heating chamber. A condensing reflector is placed on the outside of the dome. A continuous gutter is placed along its internal periphery. Radial conveying condenser tubes are connected between a central feed header at the top of the dome and the annular tube along the gutter. A sea water supply tank is posi-tioned at a level above the solar heating chamber. A condenser tank has conveying coils in the fluid receiving condensate from peripheral gutter. The distilland is filtered and fed to an underground reservoir. (Sinha-OEIS) W74-04720

3B. Water Yield Improvement

WORLD DESERTIFICATION: CAUSE AND EFFECT. A LITERATURE REVIEW AND ANNOTATED BIBLIOGRAPHY,

Arizona Univ., Tucson. Office of Arid Lands Stu-

W. C. Sherbrooke, and P. Paylore.

w. C. Sacrotocke, and r. Paylore. Available from the National Technical Informa-tion Service as PB-228 100 \$5.50 in paper copy, \$1.45 in microfiche. Arid Lands Resource Infor-mation Paper No 3, 1973. 168 p, 252 ref. OWRR W-141(3729)(3), 14-31-0001-3729.

*Droughts, Descriptors: *Deserts, Descriptors: "Deserts, "Drougnts, *Bibliographies, Semiarid climates, Arid climates, Arid lands, Weather modification, Agroclimatology, Reforestation, Soil stabilization, Water shortage, Grazing, Burning, Land use, Land management, Conservation, Plant populations, Climatology, Irrigation practices, Carrying capaci-

Identifiers: *Climatic change, *Desertification,

An annotated bibliography is presented of 252 references, computer-produced from the University of Arizona's Arid Lands Information System (ALIS), with accompanying text that reviews briefly both cause and effect of world desertification. Causes fall into two categories: long-term (in the geologic sense) climatic change as supported by meteorological, archaeological, geomorphological, vegetational, palynological, and dendrochronological evidence in the literature; and those activities of man's historic occupance of arid and semiarid regions that have contributed to degeneration of marginal lands: agricultural and irrigation practices, grazing, fire, nomadism, and sand stabilization and reforestation. Beyond these two categories, there is a third: climatic fluctuation -- short-term weather patterns induced by un-certain rainfall and followed by cyclic droughts from which marginal areas may not recover if subjected to continued attempts at intensive use that cannot be sustained by a dry year or a succession of dry years. Insufficient water and attempts to increase water supplies to areas endangered by desertification are problems which must be addressed promptly, but training, education, financing, and cultural adaptations will also be required, probably under (Paylore-Ariz.) W74-04461 international sponsorship.

WATER RESOURCES APPLICATIONS, Geological Survey, Rolla, Mo. Water Resources For primary bibliographic entry see Field 7B.

AVAILABILITY OF GROUND WATER IN THE WINNSBORO AREA, LOUISIANA, Geological Survey, Baton Rouge, La. For primary bibliographic entry see Field 4B. W74-04596

ELECTRIC CLOUD AND WEATHER MODIFI-CATION WITH INTENSE RELATIVISTIC ELECTRON BEAMS, Nevada Univ., Reno. Desert Research Inst.

F. Winterberg. Nature, Vol 247, No 5439, p 271, February 1, 1974.

Descriptors: *Weather modification. *Artificial precipitation, *Electrical studies, *Cloud physics, Lightning, Electrical coronas. Identifiers: *Electron beams.

A method of electric cloud and weather modifications is proposed, based on the projection of a rapid sequence of intense relativistic electron beams into the atmosphere. The maximum range in the atmosphere of relativistic electrons is given by the radiation length, about 280 m, which is rapidly approached for electron energies in excess of 50 MeV. A beam of electrons would normally disperse rapidly in the radial direction due to multiple scattering. This however, is not the case for an intense beam of relativistic electrons which is an intense beam of relativistic electrons which is confined by its own magnetic field. Beams up to 1,000,000 A and with electron energies of many million electron volts lasting up to 100 ns have been already produced by the combination of a Marx surge generator with a Blumlein transmission line, connected to a field emission diode. The total beam energies so far achieved reach the value of megajoules. If such a beam is projected into the

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 3

Conservation In Agriculture—Group 3F

atmosphere it will not disperse radially but rather will produce a channel of hot air, with a maximum channel length equal to the radiation length in air. If now repeated beams are projected into this channel after a time lapse which is equal to the time for the air to expand in the channel heated by the first beam, then the following beams will in part propagate through air of reduced density due to the thermal expansion caused by the first beam. For 10 pulses the length would be 2.4 km. The method permits the disposal of a large negative electric charge into a chosen volume of the atmosphere or of a cloud. The local release of elecmosphere of or a cloud. The local release of electric charges can result in greatly increased electric fields within a certain cloud region leading to enhanced cloud droplet coalescence resulting in increased precipitation. (Knapp-USGS) W74-04604

3C. Use Of Water Of Impaired Quality

APPLICATION OF DYNAMIC PROGRAMMING IN MARKOV CHAINS TO THE EVALUATION OF WATER QUALITY IN IRRIGATION, Hebrew Univ., Jerusalem (Israel). D. Yaron, and A. Olian.

American Journal of Agricultural Economics, Vol 55, No 3, p467-471, August 1973. 1 tab, 14 ref.

Descriptors: Water resources development, *Dynamic programming, *Markov processes, *Economics, *Evaluation, *Water quality, Irrigation, *Saline water, Value, Estimating, Planning, Optimization, Methodology, Mathematical models, Systems analysis, Regional analysis. Identifiers: *Mediterranean climate, Salt leaching, Yield fundtions.

System dynamics play an important role in situa-tions typical to the Mediterranean climate, where a dry summer is followed by a wet winter with stochastic quantities of rainfall. Presented in an economic analysis of the effect of water quality on crop yield, emphasizing the dynamic aspects of ir-rigation with saline water over a sequence of years. Distinction is made between three ranges of time and three corresponding models for analysis of the value of water quality in irrigation: 'short run' model (confined to one irrigation season), 'longrun' model, and 'extended long run' model.
The long run model, which accounts for the effects of salt accumulation in the soil profile over time (salt accumulation is underground reservoirs would be considered in the extended long run model) is considered and dynamic programming in Markov chains is utilized to derive an optimal ir-rigation policy. Estimates of the value of water quality in irrigation are derived which rely heavily on assumptions and yield functions. Possible ap-plications in water resource decisions are discussed. The economic significance of the model is on two levels, the micro farm level and the level of regional water resource development. (Bell-Cornell) W74-04561

3D. Conservation In Domestic and **Municipal Use**

MANAGEMENT OF STORMWATER RUNOFF IN SUBURBAN ENVIRONMENTS, Engineering-Science, Inc., Cincinnati, Ohio. For primary bibliographic entry see Field 5D. W74-04302

OPTIMAL OPERATION OF MULTI-RESER-VOIR WATER RESOURCES SYSTEMS, Texas Univ., Austin. Center for Research in Water. For primary bibliographic entry see Field 4A. W74-04314

MULTIPURPOSE RESERVOIRS AND URBAN DEVELOPMENT, North Carolina Univ., Chapel Hill. Center for

Urban and Regional Studies. For primary bibliographic entry see Field 6B. W74-04319

APPROACHES TO STORMWATER MANAGE-

MENT, Hittman Associates, Inc., Columbia, Md. For primary bibliographic entry see Field 5A.

STATISTICAL ANALYSIS OF HYDROGRAPH CHARACTERISTICS FOR SMALL URBAN WATERSHEDS.

Fracor, Inc., Austin, Tex.
For primary bibliographic entry see Field 2A.
W74-04459

THE RAJASTHAN CANAL AREA: A SETTLE-

MENT STRUCTURE, Delhi Univ., New Delhi (India). School of Planning and Architecture. For primary bibliographic entry see Field 6D. W74-04499

SYRACUSE METROPOLITAN AREA COM-PREHENSIVE PLAN-WATER AND SEWER PLAN AND SERVICES ALLOCATION PLAN, Syracuse-Onondaga County Planning Agency,

For primary bibliographic entry see Field 5D. W74-04507

PRATTVILLE, ALABAMA COMMUNITY DEVELOPMENT PLAN, VOL. II: SUMMARY

DEVELOPMENT FLAN, VOL. II: SUMMARY AND ILLUSTRATIONS. Central Alabama Regional Planning and Develop-ment Commission, Montgomery. For primary bibliographic entry see Field 5D. W74-04508

SUMMARY REPORT OF METROMEX STU-DIES, 1971-1972.

Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 2B.

HOUSING AND PLANNING REFERENCES. Department of Housing and Urban Development,

Washington, D.C. wasnington, D.C.

For sale by the Superintendent of Documents,
U.S. Government Printing Office, Washington,
D.C. 20402 - Price \$1.75. New Series No. 49.
July/August, 1973. 88 p.

Descriptors: *Bibliographies, Information retrieval, *Sewerage, Comprehensive planning, *Water supply, Conservation, Storm drains, Water resources, Shores, Ecology, *Planning, Cities, *Urbanization.
Identifiers: Geographic index, KWIC index,

This report consists of 934 Comprehensive Planning (HUD 701) Reports, arranged by Geographic and KWIC indexes. Accession number, title, report date, state, and geographic place name information is given for every entry. Fifty-four entries are included that cover the topics of water supply, conservation, sewer disposal and storm sewers, water resources, ecology and environ-ment, and shorelines . A revised Subject Heading List for 'Housing and Planning References' and an up-dated listing of the HUD Library and Information Division's Publications in Print are also in-cluded. (Hoffman-North Carolina)

EVALUATION OF THE USE OF PRICING AS A

TOOL FOR CONSERVING WATER, George Washington Univ., Washington, D.C. Dept. of Management Sciences.

M. H. Chiogioji, and E. N. Chiogioji.

Washington (D.C.) Technical Institute, Water

Resources Research Center. WRRC Report No. 2, 1973. 201 p, 11 fig, 46 tab, 211 ref, append

Descriptors: *Pricing, *Water conservation, *District of Columbia, Water policy, Water consumption, Water supply, Water costs, Evaluation, Water rates, *Municipal water, Maryland, *Water utilization, *Water demand, Management, Virginia. Identifiers: Washington, D.C.

Historically the economics of water supply has been oriented toward the provision of low cost water to consumers, with very little thought given to pricing principles and policies which could govern the efficient use and development of municipal water resources. Empirical data gathered in the Washington(D.C.)Metropolitan Area show that price increases do have an impact on water consumption. The use of demand management through price policy is proposed as a tool for ra-tioning existing supplies. There is evidence that demand curves for industrial, agricultural, and some domestic uses are significantly price elastic. A two-part rate structure is also proposed to cover the off-peak winter period and the peak summer period. Other means for conserving water use also are suggested. (Palange-Washington D.C. Tech W74-04810

3E. Conservation In Industry

COLOR REMOVAL FROM TEXTILE DYE WASTE BY COAGULATION,

Auburn Univ., Ala. Dept. of Civil Engineering. For primary bibliographic entry see Field 5D.

WATER REUSE AND DEPOSITS CONTROL, Buckman Labs., Inc., Memphis, Tenn. For primary bibliographic entry see Field 5D. W74-04520

ECONOMIC POWER FROM GEOTHERMAL

HEAT, For primary bibliographic entry see Field 4B. W74-04766

3F. Conservation In Agriculture

SOUTHWESTERN GROUNDWATER LAW: A TEXTUAL AND TERPRETATION, BIBLIOGRAPHIC

Arizona Univ., Tucson. Office of Arid Lands Stu-For primary bibliographic entry see Field 4B. W74-04460

PAPER MILL SLUDGE DISPOSAL ON SOILS: EFFECTS ON THE YIELD AND MINERAL NUTRITION OF OATS (AVENA SATIVAL.). Wisconsin Univ., Madison. Coll. of Agricultural

and Life Sciences.

For primary bibliographic entry see Field 5E. W74-04519

PLANT RESPONSES TO WATER STRESS, California Univ., Davis. Lab. of Plant-Water Rela-

For primary bibliographic entry see Field 21. W74-04539

Field 3-WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F—Conservation In Agriculture

MILL'S WASTE WATER USED FOR SPRAY IR-

For primary bibliographic entry see Field 5D. W74-04543

SOIL CRUSTING RELATED TO SPRINKLER

Auburn Univ., Ala. Dept. of Agricultural En-

Gineering.
C. D. Busch, E. W. Rochester, and C. L. Jernigan.
Transactions of the ASAE, American Society of
Agricultural Engineers, Vol 16, No 4, p 808-809,
1973. 5 fig, 2 tab, 10 ref. OWRR A-025-ALA(1).

Descriptors: Soils, *Sprinkling, *Infiltration, Runoff, Erosion, *Sprinkler irrigation, *Regression analysis, *Soil moisture. Identifiers: *Crusting(Soils).

Regression analyses were run to correlate crust strength and crust moisture data. In both field and laboratory studies, the quadratic regression equation of penetrometer (crust strength) reading on crust moisture provided the best fit. It appears that strengths developed under two different sprinkling intensities persist over three wetting and drying cycles. Lower sprinkler application rates consistently produced a weaker crust. In-creasing the number of water application cycles did not show a consistent effect on crust strength. Previous sprinkling may reduce the strength of a crust formed by subsequent rainfall. W74-04560

ECONOMIC ASPECTS OF GROUND WATER RESOURCES AND REPLACEMENT FLOWS IN SEMIARID AGRICULTURAL AREAS.

New Mexico Univ., Albuquerque. For primary bibliographic entry see Field 4B.

A SIMULATION MODEL FOR EVALUATING IRRIGATION MANAGEMENT PRACTICES, Minnesota Univ., St. Paul. Dept. of Agricultural

Engineering. R. V. Morey, and J. R. Gilley.

Transactions of the ASAE (American Society of Agricultural Engineers), Vol 16, No 5, p 979-983, Sept.-Oct. 1973. 5 fig, 16 ref.

Descriptors: Water resources development, *Irrigation systems, *Evaluation, *Management, *Irrigation practices, *Simulation analysis, Meterorological data, Crops, Transpiration, Humid areas, Operation and maintenance, Mathematical models, Systems analysis, *Minnesota, *Soil moisture.

Soil moisture budget. Identifiers: Cloud(Minn.).

Rainfall variability is an important factor in the analysis of the feasibility of irrigation in humid areas. In addition, soil moisture holding characteristics, crop transportation rates, and operating procedures for the proposed irrigation system must be considered in a complete evaluation. Presented is a soil moisture budget model for simulating and evaluating irrigation systems and management practices. A modified procedure for budgeting the soil moisture content, a modified growth measure index for computing system per-formance, and example comparisons of irrigation management procedures are presented. Results of a calibration-verification technique are included. The model is used to test several irrigation management policies for two soil types and 24 years of weather data for St. Cloud, Minnesota. Results give a good insight into the variability in year-to-year transpiration response under irriga-tion. They also show the effect of irrigation policies on improvement of the transpiration ratio. Finally, the results should be useful in aiding irrigation operators to make better management decisions concerning irrigation feasibility and scheduling procedures. (Bell-Cornell) W74-04564

COST-BENEFIT ANALYSIS OF IRRIGATION PROJECTS IN NORTHEASTERN BRAZIL, Brookings Institution, Washington, D.C.

American Journal of Agricultural Economics, Vol 55, No 4 Part I, p622-627, November 1973. 1 tab, 7

Descriptors: *Irrigation programs, *Project feasibility, Evaluation, *Linear programming, *Costbenefit analysis, *Labor, Employment opportunibility, Evaluation, Entra Programment opportuni-ties, Costs, Arid lands, Optimization, Mathemati-cal models, Systems analysis.

Identifiers: *Brazil(Northeast), *Shadow prices,

Crop selection, Crop schemes.

Cost-benefit analysis using empirical estimation of labor's shadow price and linear programming for crop selection is applied to major irrigation pro-jects in Northeastern Brazil. The projects tend to be large government schemes with very high in-vestment costs and correspondingly are capital intensive. Due to their high capital intensity, the projects would contribute very little to labor absorp-tion. Labor costs are evaluated at an empirically estimated shadow price rather than at the legal minimum wage. The shadow price of labor used is the weighted average of estimated marginal value products within farm size and product sector sub-groups, with weights proportional to the percentgroups, with weights proportional to the percentage of labor force in each subgroup. The empirical
estimate is based on production functions for
Northeastern agricultural sectors previously estimated by the author. Discussed is the selection of
crop mix for the irrigation projects, using a linear
programming optimization incorporating demand
limitations. In conclusion, over half the project
area is approved. However, these capital intensive projects should rank below investments with similar rates of return but larger employment ef-fects. These projects do not offer a major solution to rural poverty in the Northeast since they would provide employment for less than 2 percent of the region's rural labor force. (Bell-Cornell)

ALLOCATION OF SCARCE RESOURCES TO AGRICULTURAL RESEARCH: REVIEW OF METHODOLOGY.

North Crolina State Univ., Raleigh. Dept. of Economics. C. R. Shumay.

American Journal of Agricultural Economics, Vol 55, No 4 Part I, p557-566, November 1973. 4 tab,

Descriptors: *Resource allocation, *Methodology, *Agriculture, *Research, *Management, *Project planning, Model studies, Surveys, Investment, Evaluation, Cost-benefit analysis, Optimization, Systems analysis, Water resources, *Reviews, Publications.

Identifiers: Project selection.

With an increasing stress on research budgets, the need for investigating alternative models for managing research is growing. Already, much work has been invested in technique development. This literature has been surveyed selectively to emphasize the breadth of methodological developments for research project selection and resource allocation. To precede additional research, the current state-of-the-art in resource allocation methodology pertinent to agricultural research management is presented. The focus is on quantitative approaches for improving internal con-sistency of subjective judgments. The marginal principle is applicable to the selection of an optimal investment in management, and a rudimenta-ry framework for implementing that principle is suggested. Methods of ranking projects using both single and multi-dimensional measures of project benefit are presented. Methods within the latter category include information systems, scoring models, and benefit contribution models. Ap-proaches for optimizing resource allocation are discussed. Among these are: benefit-cost analysis, optimization models specifically for research, simulation, and a network model. A partial comparative evaluation of the selected methods is included with the survey. In the area of methodological development, there is great need for innova-tive thought and practical experimentation to compare costs and benefits of alternative subjective decision processes. (Bell-Cornell) W74-04566

APPLICATION OF REGRESSION ANALYSIS TO ESTIMATION OF THE EFFICIENCY OF WATER USE IN IRRIGATION (OPYT PRIMENENIYA REGRESSIONNOGO ANALIZA K OTSENKE EFFEKTIVNOSTI ISPOL'ZOVANIYA VODY PRI OROSHENII), A. Z. Zakhidov, and M. Z. Ziyakhodzhayev. Vodnyee Resursy, No 3, p 167-170, 1973. 2 tab.

Descriptors: *Irrigation efficiency, *Irrigation practices, *Water utilization, *Estimating, *Regression analysis, Correlation analysis, Irrigation, Irrigation water, Irrigation systems, Drainage systems, Drainage water, Fertilizers, Crop production, Cotton, Agriculture, Equations. Identifiers: *USSR(Uzbek SSR).

The importance of water in the irrigation of lands in an arid region is discussed. Relations of cotton yield to runoff of drainage water and to rates of application of irrigation water and mineral fertil-izers were established by regression analysis on the basis of agricultural and reclamation data for the Khorezmskaya Oblast in Uzbekistan for 1956-70. Extensive development of a drainage system on saline and salt-affected lands and adoption of efficient agricultural practices will result in a sig-nificant increase in cultivated crop yield without a marked increase in the irrigation rate. Desalinzation of lands already irrigated or scheduled for irrigation in the cotton zone of the USSR is a major regional water management problem in the development and increase in efficiency of irrigated agriculture. (Josefson-USGS) W74-04580

ROLE OF SOIL CONDITIONS IN THE DEVELOPMENT OF MOTHS, (IN RUSSIAN), Akademiya Nauk Azerbaidzhanskoi SSR, Baku.

Akademiya Nauk Azeroauzhanskoi SSR, Baku-Institut Zoologii. S. V. Aliev, and R. M. Akhmedov. Ekologiya. Vol3, No 6, p 81-84. 1972. Identifiers: Agrotis-Exclamationis, Agrotis-Yp-silon, *Cotton, *Grain, *Moths, *Soil types, USSR(Azerbaidzhan), Caterpillars.

An investigation of grain (unirrigated and irrigated) and cotton fields in 31 regions of Azerbaidzhan, USSR, revealed that caterpillars of Agrotinae, including Agrotis ypsilon and A. exclamationis, are found most often in nature on unirrigated (lowland and piedmont) chestnut, lightchestnut, and chernozem soils and in irrigated fields on friable chestnut and sandy and sandyloam sierozem soils. There are almost no caterpillars in salinized, clay, calcareous, and meadow soils.—Copyright 1973, Biological Abstracts, Inc. W74-04640

RELATIONS BETWEEN SOIL WATER POTEN-TIAL AND DISEASE IN WHEAT SEEDLINGS INFECTED BY PUCCINIA RECONDITA,

Pye Research Center, Stowmarket (England). M. C. Cowan, and J. C. Zadoks. Neth J Plant Pathol. Vol 79, No 1, p 1-4. 1973.

Identifiers: *Puccinia-recondita, *Soil water potential, Spores, *Wheat seedlings, *Uredospore infection, Seedlings(Diseases).

The seedlings were grown in soil of which the initial water potential was -200/Jkg (joules/kg), -500/Jkg, or -800/Jkg. Uredospore production per seedling was retarded when the soil water potential was low, and soil water potential decreased

more rapidly near the roots of diseased seedlings than it did near the roots of uninoculated seedlings.--Copyright 1973, Biological Abstracts, inc. W74-04653

WATER WITHDRAWAL BY PLANT ROOTS, Institute for Land and Water Management Research, Wageningen (Netherlands). R. A. Feddes, and P. E. Rijtema.

J Hydrol Amst. Vol 17, No 1/2, p 33-59. 1972. Illus. Identifiers: Brassica-oleracea, Growth stages, *Red cabbage, *Roots, *Water withdrawal(Plants).

Water withdrawal patterns of red cabbage (Brassica oleraces L., cv. 'Rode Herfst') grown on a sticky clay soil are analyzed. An analysis of the transport resistance for liquid flow in the plant as well as an investigation on the geometry factor of the root system for red cabbage is presented. The variation of these factors with depth is described, and root extraction rates at different depths are calculated and compared with data obtained from water balance studies. The plant resistance data are in reasonable agreement with existing literature. Because of a nonhomogeneous and poor root development in the early stages of growth, the geometry data of the initial growing stages differ by a factor of 10 from data found in literature. With root development increasing with depth, geometry data decrease to values also reported for other crops. From calculations it is shown that at increasing drying out of the soil the geometry fac-tor is slightly affected, but the plant resistance in-creases considerably. The latter resistance, however, decreases when the evaporation flux from the plant increases. This phenomenon is mainly caused by the root distribution in the soil with depth, resulting in a relatively higher water uptake from the top layers, as compared with the deeper layers, when the evaporation flux increases. The results may at least partly explain the apparent non-Darcian behavior of the flux of water through the plants .-- Copyright 1973, Biological Abstracts, W74-04655

INFLUENCE OF SOIL MOISTURE CONDITIONS ON GROWTH AND DEVELOPMENT OF THE POTATO SOLANUM TUBEROSUM L., Technische Universitaet, Hanover (West Germany). Institut fuer Gemuesebau.

H. Krug, and W. Wiese.
Potato Res. Vol 15, No 4, p 354-364. 1972, Illus,

Potato Res. Vol. 15, No. 4, p. 357-364.

(English summary).

Identifiers: Assimilation, Consumption, *Growth stages, *Potato, Productivity, *Soil moisture, Solanum-Tuberosum, Tuber.

The influence of high (80-100% saturation) and low (20-30% saturation) soil moisture during different growth stages on growth and development of the early cultivar 'Barima' was investigated by means of pot experiments under controlled temperature.

Constant high soil moisture, as compared with low soil moisture, increased the growth rate of stems. leaf area and tubers. The net assimilation rate was higher and the number of tubers greater but, in contrast to low soil moisture conditions, about 50% of the tubers was resorbed during succeeding periods of growth. Plants flowered earlier and more abundantly and the length of the growing period was shorter. Low soil moisture during the early growth stages only increased productivity of the plants. Highest tuber yields occurred where there had an initial dry period of up to 36 days. Low soil moisture following a period of high soil moisture caused a pronounced reduction in the growth rates of aerial organs followed by shedding of the basal leaves. The growth rate of the tubers was reduced to a lesser extent and resorption of tubers decreased. High soil moisture prior to tuber set increased tuber initiation during the subsequent dry period. Water consumption was doubled at high soil moisture. Soil moisture during the period was shorter. Low soil moisture during the

growth of the mother plants influenced the seed value of the tubers. Initial dry periods decreased time to emergence and increased growth in height of the young plants. The influence of changing soil moisture conditions on growth and bulking in the field are discussed .- Copyright 1973, Biological Abstracts, Inc. W74-04687

A COMPARATIVE STUDY OF THE SIZE AND RECEPTIVITY OF THE STIGMA IN WHEAT, RYE, TRITICALE AND SECALOTRICUM, Max-Planck-Institut fuer Zuechtungsforschung,

Cologne (West Germany).

L. D'souza. Z Pflanzenzuecht. Vol 68, No 1, p 73-82. 1972, Illus

Illus. Il

The duration of stigma receptivity was studied under controlled conditions. The receptivity of the stigma has 2 phases. In the first the stigma is very stigma has 2 phases. In the first the stigma is very receptive; the decrease in seed set/day is slight. The second phase is marked by a sudden drop in seed set. The duration of both phases is influenced by temperature and moisture, the influence of the former being greater. In wheat at 20C and 66% relative humidity (RH) both phases last 4 days. At 30C and 40% RH the first phase lasts only 2 days, the second 3 days. In rye at 20C and 66% RH the first phase lasts 6 days, the second 5 days; at 30C and 40% RH the 2 phases have a duration of 3 days each. The duration of receptivity in Triticale and Secalotricum is similar to that of rye. There is no significant difference in the size of stigmas of rye, Triticale and Secalotricum. All have significantly lower stigmas than wheat. The importance of these studies for hybrid wheat production is discussed. Wheat is suitable for wind pollination both as pollen donor and receiver but only under favorable conditions. High temperatures and how humidities are detrimental.—Copyright 1973, Biological Abstracts. Inc. W74-04690

POTENTIAL INTENSITY OF PHOTOSYNTHES-IS IN SOME TOMATO AND BEET SPECIES UNDER DIFFERENT SOIL MOISTURE, (IN

RUSSIAN), Akademiya Nauk SSSR, Petrozavodsk. Inst. of Biology. V. S. Rodionov.

Fiziol Biokhim Kul't Rast. Vol 4, No 6, p 641-644.

1972, Illus, (English summary).
Identifiers: *Beet species, Carbonic-Acid, Crops, Fodder, Moisture, *Photosynthesis, *Soil moisture, *Tomato, Vegetables.

Optimum photosynthesis was observed at soil moisture of 60-80%; below and above this level photosynthesis intensity decreased. Species (varietal) differences in assimilation of carbonic acid during drought were obtained only in fodder beet, sugar beet and leaf beet.—Copyright 1973, Biological Abstract, Inc.

SOLUBLE PHOSPHATE OUTPUT OF AN AGRICULTURAL WATERSHED IN PENNSYL-VANIA, Agricultural Research Service, University Park,

Pa. Northeast Watershed Research Center. For primary bibliographic entry see Field 5B. W74-04804

A STUDY ON THE ACCURACY OF RUNOFF ANALYSIS FOR PUMPING DRAINAGE IN PADDY FIELD AREA (IN JAPANESE), Shimane Univ., Matsue (Japan). Faculty of Agriculture.
For primary bibliographic entry see Field 4A.
W74-04811

RIDGE-POOL COMPLEX FORMATION OF KHOTKHURSKY BOG MASS (IN RUSSIAN), Biologo-Geograficheskii Nauchno-Issledovatelskii Institut, Irkutsk (USSR).

I. G. Lvakhova. Izv Sib Otd Akad Nauk SSSR Ser Biol Med Nauk.

3. p 60-64, 1972, English summary. Identifiers: *Bog mass, Cattle litter, Manure, Ridge pool, Sphagnum, *USSR(Irkutsk region), *Phytocenoses.

The character of ridge-pool complex phytocoenoses of Irkutsk region (USSR) is described. The associations are Pineto sibiricae-Sphagneta squarrosi X mixto-Hypneta, Pineto sibiricae-mixto-Sphagneta X Cariceto limosaemixto-Sphagneta, and Pineto sibiricae-Cladineta X Sphagneta fusci. The comparison of their vegetation, peat deposits, and microrelief indicates the evolution of ridge-pool complex, the reduction of trophic plants and the development of progressive ridge formation. The upper layers of Sphagnum peat may be used for cattle litter while lower Layers (fen peat) may be used for manuring.--Copyright 1973, Biological Abstracts, Inc. W74-04812

UTILIZATION OF NUTRIENTS FROM SOIL AND FERTILIZERS BY PASTURE GRASS AS DEPENDENT ON SOIL MOISTURE (IN RUS-

SIAN), For primary bibliographic entry see Field 4A. W74-04820

EFFECT OF LIGHT INTENSITY ON THE QUALITY AND FEEDING EFFECTIVENESS OF

GREEN FODDER, (IN RUSSIAN), M. A. Babakhanyan, S. T. Akhverdov, O. B. Gasparyan, G. A. Akopyan, and N. A.

Biol Zh Arm 24(8): 70-77. Illus 1971. Identifiers: Feeding, *Green fodder, Intensity, *Light intensity, Minerals, Nitrogen, Proteins, Vitamins, *Corn, *Peas.

Corn and peas were studied in an artificial environmental with air temperatures at 18-21C, air oisture 60-80% and light intensity of 1200, 4000, 8500, 16,000 and 32,000 erg/cm sq. sec. Increase in light intensity improved retention of mineral elements and guaranteed high yield of green fodder and retention of protein N, vitamins, etc. Green fodder grown under 8500 ergs/cm sq. sec. intensity increased weight of suckling pigs by 4.5 kg in 70 days as compared to 1.7 kg for fodder grown under 1200 ergs/cm sq sec intensity.—Copyright 1973, Biological Abstracts, Inc. W74-04821

DROUGHT RESISTANCE OF RADIATION-IN-DUCED MUTANT VARIETIES AND PARENT FORMS OF COTTON, (IN RUSSIAN), Akademiya Nauk Uzbekskoi SSR, Tashkent. Inst. of Experimental Plant Biology.
N. N. Nazirov, and N. T. Tashmatov.
Dokl Akad S-Kh Nauk. 12. p 15-17. 1972.

*Cotton, *Drought resistance,

A comparison of radiation-induced cotton mutants with their initial forms showed that radiation does not substantially affect their drought resistance, despite large difference in other characteristics (photoperiodism, boll size, color and properties of the fiber, ect.). If the initial form was very sensitive to a water shortage in the soil or relative resistant to it, the mutant obtained from it also proved to be, respectively, non-resistant or comparatively resistant.--Copyright 1973, Biological Abstracts, Inc.

Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F-Conservation In Agriculture

THE EFFECT OF WATER SPRAYING ON THE REIN-FORCEMENT OF PHYSIOLOGICAL PROCESS IN COTTON PLANTS.

A. I. Efanova.

Dokl Akad Nauk Tadzh SSR. 15-(9): p 57-59. 1972. *Cotton, *Organic esis, Physiological Identifiers: *Cotton, *Organ *Photosynthesis, Physiologic *Transpiration, *Spray irrigation. compounds. processes.

Four groups of plants were sprayed with 500, 1000, 1500 and 2000 l/ha. Spraying at 1500 l/ha was the most effective; it increased photosynthesis, and the intensity of transpiration and the formation of larger quantities of organic compounds.—Converse 1027, Biological Abstracts, Inc. Copyright 1973, Biological Abstracts, Inc W74-04823

WATER CONSUMPTION AND BIOLOGICAL COEFFICIENT OF FURROW AND SPRINKLER IRRIGATED COTTON, (IN BULGARIAN),

Academy of Agricultural Sciences, Khaskovo (Bulgaria). Complex Experimental Station.

K. Karev. Rasteniev''d Nauk. 9(4): p 83-92. Illus 1972.

(English summary). Identifiers: Biological coefficient, *Cotton, Gos-sypium-Hirsutum, *Sprinkler irrigation, *Water utilization, *Irrigation(Furrow).

The mean 24-hr water use of the native variety No.

4521 of Gossypium hirsutum species varied from planting to development of the 3rd true leaf between 9 and 16 cu m/ha, increasing after that its maximum in the subperiod of most intensive growth and development (flowering-fruiting) of 35 to 53 cu m/ha and declining to 9-19 cu m/ha at the end of the crop-growing season. The consumptive use of water of irrigated and fertilizer cotton fluctuated with the meteorological character of the season between 4210 and 4740 cu m/ha and of nonirrigated and unfertilizer cotton from 2730 and 3330 cu m/ha. At the given level of fertilization (N120P180K60 kg/ha) and at an antecedent soil moisture maintained from flowering to fruiting to both soil depths of over 75% field capacity, the mean 24-hr and the total water consumption of furrow and sprinkler irrigated cotton do not differ substantially because of similar net depths of irrigation water applied. The mean 24-hr water use varied in dependence on the depth to which the soil was wetted. It was from 2 to 4 cu m/ha higher from flowering to ripening in plots the soil of which was wetted to 40 cm compared to that of 70 cm. Soil wetting to 40 cm from flowering to fruit-ing contributed to a better water supply. The biological coefficient R of unirrigated cotton, estimated after A. M. Alpatev, averaged 0.23 and of ir-

RESULTS OF TRIALS WITH TOBACCO AND COTTON ROTATIONS UNDER IRRIGATION, (IN BULGARIAN), Y. Mulkovski, and I. Popivanov

rigated cotton varied from 0.32 to 0.36. In the vari-

ants with soil wetting to 40 cm in the flowering-ripening subperiod it averaged 0.34 and with wetting to 70 cm, 0.35.—Copyright 1973, Biological

Abstracts, Inc.

W74-04824

Rasteniev''d Nauki. 9(5): p 87-105. 1972. (English summary).

Identifiers: Barley, *Cotton, *Irrigation, Maize, Peanuts, Peas, Poppy, *Tobacco, *Crop rotation.

Cotton and tobacco can be grown alternately and in sequence with other crops (lucerne, barley, peanuts, poppy). Tobacco-cotton rotations were most effective when tobacco was followed by soil-protecting crops such as winter forage pea, winter vetch, garden peas). Post-stubble and soil-protectring winter crops have a positive effect on tobacco. The quality of tobacco grown after regular predecessors is always high, after catch crops it approximates that of tobacco grown in monoculture. Tobacco growing in monoculture gives a lower total produce than tobacco grown in some of the experimented rotations with and without catch

crops in which it is in sequence with regular crops in which it is in sequence with regular predecessor crops. Tobacco growing is most effective in a rotation with cotton as well as in rotations with peanuts, barley, poppy, winter peas and winter vetch, with steady participation of soil-protecting crops following tobacco and silage maize as catch crops following regular predecessors. The total produce in such rotations is from 11 to 67% higher than of tobacco grown in monoculture. Culturation of tobacco in continuous with other cross in tivation of tobacco in rotations with other crops is also an important measure against black shank which causes serious damages in the Sandanski Petrich region, USSR.--Copyright 1973, Biological W74-04825

EFFECTS OF FLOODING AND DRAINING AND THEIR ALTERNATION ON THE GROWTH AND UPTAKE OF NUTRIENTS BY RICE (ORYZĄ SATIVA L., INDICA VAR. IR-8), University of the Panjab, Lahore (Pakistan). Dept.

Khalid Hamid Sheikh

J Exp Bot. 24(78): p 64-75. Illus. 1973. Identifiers:

Chlorosis, Cultivars, Growth rates, Iron, Oryza-Sativa-Indica, *Drainage, Flooding, Manganese, Nutrients, Rice

Continuous flooding of the soil (flooded treat-ment) gave best growth of the cultivar IR-8, whereas soil drained for 4 wk and then flooded for 8 (drained and flooded treatment) resulted in poorest growth and chlorotic plants. Plants grown in the continuously drained soil (drained treat-ment) and those in the soil flooded for 4 wk and then drained for 8 (flooded and drained treatment) showed intermediate growth. There were no differences in the relative water content of plants growing in the various treatments. Analyses of plant tissues showed that a consideration of the relative concentration of Fe, Mn, and P in the shoots is most closely related to the performance of rice under various cultural conditions. An increase in the concentration of Fe in the plant tissues following flooding was correlated with the best growth (flooded treatment) unless it was accompanied by high level of Mn (as in the drained and flooded treatment) which may have proved and flooded treatment) which may have proved toxic, e.g., by interference with Fe metabolism as was evidenced by chlorosis. Measurements of oxidation-reduction potentials, O2 diffusion rates, and the concentration of exchangeable and soluble Fe and Mn in the soils showed that the drained and flooded treatment caused the most extreme reducing conditions. Flooding accompanied by the development of extreme reducing conditions led to a greater accumulation of Mn in the shoots (drained and flooded treatment) whereas flooding accompanied by the maintenance of oxidizing conditions (flooded treatment) resulted in a lower uptake of Mn. Growth of rice plants for 4 wk in the drained soil did not fit them for the reduced conditions which developed during subsequent flooding (drained and flooded treatment).--Copyright 1973, Biological Abstracts, Inc. W74-04826

NUTRIENT UPTAKE BY WINTER WHEAT IN A ZONE OF UNSTABLE MOISTURE, (IN RUSIAN),
I. M. Shaposhnikova, and L. I. Makarova.

Agrokhimiya. 3. p 51-56. Illus. 1972.
Identifiers: *Nutrients, *Wheat(Winter), *Soil moisture, Moisture zones, Nitrogen, Phosphorus,

In black-soils characterized by moisture instabili-In black-soils characterized by moisture instability, the accumulation of dry matter, N and P by the plants was prolonged to the ripening phase, and that of K to the ear formation phase. The fertilizers increased the amount of dry matter of plants and the accumulation of N, P and K. The ratio of K:P205:K2O in the plants changed depending on the phase of development and nutritional conditions.—Copyright 1973, Biological Abstracts, Inc. W74-04827

A STUDY ON THE DEPTH OF BASIC TILLAGE AND SOIL FERTILIZATION FOR MAIZE GROWN UNDER IRRIGATION, (IN BULGARI-

AN), Academy of Agricultural Sciences, Chirpan (Bulgaria). Inst. of Cotton.

N. Kralev. Rasteniev''d Nauki. 9(5): p 107-118. Illus. 1972. (English summary).

Identifiers: *Fertilization, *Irrigation, Plowing, Soils, Tillage, *Corn(Field).

The depth of plowing for maize grown in the rota-tion maize-wheat-maize on leached chernozemsmolnitsa soil was studied. Basic tillage for maize (1st field) was experimented at the depths of 18-20, 28-30, 38-40 cm with soil loosening in addition to 8-10 cm at 3 fertilizer levels, no fertilizing, mineral fertilizing at the level in kg/ha of N160P160 and organic fertilizing at the rate of 20 tons/ha. The depth of plowing for wheat was 10 to 15 cm and for maize in the 3rd year 18 to 20 cm. The results of the 5-yr study showed that with no fertilizers the maize yield increases significantly as a result of til-lage to a greater depth. Application of mineral and organic fertilizers, in combination with ploughing to 28-30 and 38-40 cm and with irrigation, raises to 28-30 and 38-40 cm and with irrigation, raises the grain yield by 510 and 520 kg/ha respectively. Plowing to 25 cm combined with 8 to 10 cm subsoiling has no greater effect upon the yield than plowing to 18-20 cm. The aftereffect of ploughing upon the following wheat crop is slightly mainifested at greater plowing depth. In the 3rd yr after subsoiling an influence was observed in the experimental variants with mineral and organic fertilizing in the instances of ploughing to a greater depth. The effect of fertilizing increased substantially when the basic tillage was done at the depths of 28-30 and 38-40 cm.—Copyright 1973, Biological Abstracts, Inc. W74-04828

RAINFED RICE IN SOUTHERN SENEGAL: EVALUATION OF THREE YEARS' EXPERI-MENTATION (1966-1969), (IN FRENCH),

Centre National de Recherches Agronomiques de

Centre National de Recherches Agronomiques de Bambey (Senegal). G. Haddad, and L. Seguy. Agron Trop Ser Riz Rizic Cult Vivrieres Trop. 27(4): p 419-461. Illus. 1972. (English summary). Identifiers: Experimentation, Fertilizers, Hel-minthosporium-Oryzae, Pyricularia-Oryzae, "Rainfed crops, "Rice, Sowing, Tillage, "Africa(Senegal), "Fungus diseases(Crops).

The major causes of poor yields in this area are: too-late sowing dates, insufficiently productive varieties, bad physical properties of the soil, bad tillage methods (most often superficial), the record rainfall in this region and frequent fungus attacks
(Piricularia oryzae, Helminthosporium oryzae).

By earlier sowing on soils well tilled and fertilized by earner sowing on soins well tuled and terturged and by the use of varieties (indica dwarf type) resistant to diseases, it is possoble to obtain yields of more than 40 q/ha, with only the risks inherent in all rainfed crops.—Copyright 1973, Biological Abstracts. Inc.

EFFECT OF FERTILIZERS AND IRRIGATION CONDITIONS ON YIELD, CHEMICAL COM-POSITION, BAKING QUALITIES OF WINTER WHEAT GRAIN OF BEZOSTAYA 1 CULTIVAR,

Gori Agricultural Inst. (USSR). Dept. of Organic Biological Chemistry.
N. I. Prokopenko.
Biol Nauki. 15(8): p 92-95. 1972.

Hentifers: Chemical composition, Cultivars, Fertilizers, Gluten, Grain, *Irrigation, Mineral, Nutrition, Protein, *Wheat(Winter), *Crops yield, *USSR(Osetian ASSR-Kirov region).

On the leached chernozem soils of the Kirov re-gion of North Osetian ASSR the maximum yield of this high-quality cultivar (up to 50 cwt/ha) was ob-

tained with irrigation and the application of N120P120K 120. In the case of irrigation without fertilizers the grain yield increased much less (6 centners/ha). The total protein and gluten contents in the grain decreased and the baking properties were of low quality. The swelling property of the gluten in acetic acid was maximum when high tester of increasing features. rates of inorganic fertilizers were applied. Better physical properties of the dough were obtained with the joint application of organic and organic fertilizers.—Copyright 1973, Biological Abstracts,

Inc. W74-04830

COMPARATIVE TESTING OF SHORT-TERM WHEAT MONOCULTURE, (IN BULGARIAN), Academy of Agriculture Sciences, Karnobat (Bulgaria). Complex Research Inst. of Agriculture. A. Vassilev.
Rasteniev'd Nauki. 9(4): p 49-58. 1972. (English

summary).

Summary.

Identifiers: Comparative testing, Decomposition,
Nitrogen, Nutrition, Organic matter, Root rot,
*Wheat monoculture, *Crop rotation, *Corn(Field).

A rotation including one year of maize and 3 yr of wheat was studied in comparison with the ordinary wheat-maize sequence. The former rotation was studied in 2 variants concerning the basic tillage to maize, namely, ordinary plowing to the depth of 25-30 cm and deep plowing to 45-50 cm. Each field (crop) received yearly fertilizers equivalent to 130 kg/ha N and 100 kg/ha P. As a variable of the test one half of each of the 2 wheat fields in the 1st rotation, i.e., the 2nd and 3rd yr of wheat received in addition one half rate of N. Prolonged wheat growing in monoculture under the conditions prevailing in the region and at present applied farming technique results in decreasing yield. This rarming technique results in decreasing yield. I his decline in yield is due mainly to poorer N nutrition because of disturbed organic matter decomposition in soil and to heavy inflicted by root rot. The 1st agent affects the wheat crop every year and the second only in years with cool and wet springs. A single plowing to a depth of 45 cm contributes to storing and preserving larger amounts of soil moisture and facilitates organic matter decomposi-tion in the soil. Additional N fertilizing increases the wheat yields reaching in some years those of the ordinary wheat-maize sequence.--Copyright 1973, Biological Abstracts, Inc.

PRODUCTIVITY AND GRAIN QUALITIES OF CERTAIN NEWLY DEVELOPED NATIVE AND FOREIGN WHEAT VARIETIES GROWN UNDER IRRIGATION, (IN BULGARIAN), Academy of Agricultural Sciences, Tolbukhin (Bulgaria). Inst. of Wheat and Sunflowers.

I. Doncheva, and V. Gotsova.

Rasteniev'd Nauki. 9(4): p 59-68. Illus. 1972.

(English summary).
Identifiers: Grain, *Irrigation, *Wheat varieties,

*Crop production.

'Bezostaya 1' and 'Erythrospermum 19-16,' 'Kaliakra,' 'Dobrudja,' 'Russalka,' 'No. 54/61-2,' 'No. 142/61-1,' 'No. 55/61-39,' and 'No. 102-4' and the newest high-productive Soviet varieties 'Kavkaz,' 'Avrora' and 'Skorospelka 35' were tested. 'Russalka' variety, under irrigation proved most productive, yielding on a 2-year average 7200 kg/ha against 6090 kg/ha for 'Bezostaya 1.' It has a low, thick and lodging-resistant stem, great earlilow, thick and lodging-resistant stem, great earliness, good frost resistance, high grain indices and medium baking qualities. As a variety of intensive type, responding positively to abundant fertilizing and irrigation, it is suited for growing under irriga-tion. The rest of native varieties and selected lines also possess enhanced productivity and a number of valuable economic properties but they are not satisfactorily lodging-resistant. They may be used as initial parental forms in hybridization while some of them may be grown on farms after a more extensive ecological testing. The new Soviet varieties 'Kaykaz.' 'Ayrora' and 'Skorospelka 35' are highly productive, have a high-quality grain and are resistant to diseases but because of insufficient lodging-resistance and late ripeness are not very suitable for growing as irrigated crops.—Copyright 1973, Biological Abstracts, Inc. W74-04832

NEW CONTRIBUTIONS TO BIOLOGICAL STUDY OF GENETIC TRANSMISSION OF RE-SISTANCE TO DRYNESS IN DOUBLE HYBRIDS OF ZEA MAYS, Paris Univ. (France).

D Ruican

Rev Biol (Lisb). 8(1-4): p 33-56. 1972.

Identifiers: Biological studies, Cell, Double, Dryness, *Genetic transmission, *Hybrids(Corn), Sap, Transpiration, *Corn(Field), *Crops re-sistance(Dryness), Crops yield.

Two series of double hybrids of Z. mays ('Iowa 4316,' U.S.A. and 'Warwick 303,' Canada) and the parent lines which consisted of 2 simple hybrids and 4 self-fertilized consanguineous lines were tested as to their drought resistance using a variety of methods. Plants were exposed to dryness in the field and in greenhouse pots. Resistance was evaluated according to the relative yields of the exposed and control plants. Also determined were the transpiration coefficient, the accumulation of dry matter and transpiration during the period following exposure, the cell sap concentration, the bound water and resistance to plasmolysis. The physiological indices by themselves did not indicate drought resistance in any of the cases; the degree of resistance could be expressed only by the percentage of values obtained for these indices under dry conditions with respect to those recorded for the same plants under normal conditions. Although heterosis exerts a considerable influence on the productivity and growth of plants, its effect on physiological characteristics such as resistance to dryness is often not discernable. Thus drought resistance cannot be expected to increase from hybridization.—Copyright 1973, Biological Abstracts, Inc. W74-04833

DROUGHT AND SUPPLEMENTARY FEEDING OF SHEEP IN THE KAROO,

J. G. Cloete

J S Afr Vet Assoc. 43(3): p 243-250. 1972.

Identifiers: *Africa(Karoo), *Drought, Fodder crops, Lucerne, Maize, Molasses, Nutritional supplements, Phosphorus, *Sheep(Feeding), *Veld management, Water supply.

In a review of methods to carry sheep over seasonal droughts in the Karoo (South Africa) proper veld management, utilization of drought resistant fodder crops and the importance of an adequate water supply are stressed. Carbohydrate lack is the major nutritional deficiency, while phosphorus supplementation seems to be advantageous. During seasonal droughts veld supplementation by a lick containing energy-producing food, phosphate, salt and molasses was not only cheaper than supplementary feeding with, e.g., maize and lucerne, but eliminated pregnancy toxemia and heightened estrous activity. During protracted (periodic) droughts handfeeding must be used, which must be begun when the body mass in the case of dry sheep is reduced to about 85 lb (38.6 kg). The best results were obtained with a ration of maize and lucerne hay in equal parts.--Copyright 1973, Biological Abstracts, Inc.

4. WATER OUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

MATHEMATICAL MODELING OF STREAM STORAGE POTENTIAL, Arkansas Univ., Fayetteville. Water Resources Research Center. For primary bibliographic entry see Field 2E. W74-04305

SOCIOCULTURAL IMPACT OF RESERVOIRS ON LOCAL GOVERNMENT INSTITUTIONS, ANTHROPOLOGICAL ANALYSIS OF SOCIAL AND CULTURAL BENEFITS AND COSTS FROM STREAM CONTROL MEASURES--PHASE 4, Kentucky Water Resources Research Inst., Lex-

ington

For primary bibliographic entry see Field 6B. W74-04311

OPTIMAL OPERATION OF MULTI-RESER-VOIR WATER RESOURCES SYSTEMS,

Texas Univ., Austin. Center for Research in

Water.

W. S. Butcher, and A. Sundar. Technical Report No CRWR-100, HYD-14-7301, October 1973. 136 p, 27 fig, 26 tab, 59 ref. OWRR B-096-TEX(2). 14-31-0001-3651.

Descriptors: *Management, Water resources development, Urbanization, Systems analysis, *Optimization, Stochastic processes, *Dynamic Programming, *Texas, *Reservoir operation, Mul--purpose reservoirs, Waste demands, Water Identifiers: *San Antonio(Tex).

A method is developed for solving the problem of optimal operation of multi-reservoir water resources systems. In the method employed, account is taken not only of the stochastic aspects of the inflows but also those of demands and the possible correlation between inflow and demand sequences, as well as the uncertainties of future demographic and economic factors. The multireservoir system is decomposed into interlinked subsystems for which operating policies are developed by separate dynamic programming formulations. An iterative procedure is used to adjust the operating policies of the subsystems until the necessary correspondence between the subsystem policies is reached. Synthetically generated sequences of inter-related inflows and demands are used to gain insight into the variation of system performance caused by the uncertainties in in-flows and demands, while the concept of alterna-tive futures is utilized to gauge the effect of changes in demographic and economic factors. The efficacy of the method is demonstrated by applying it to derive the optimal operation of the San Antonio water resources system. (See also W74-04315) W74-04314

COMPLETE LISTING OF PROGRAM DESCRIBED IN OPTIMAL OPERATION OF MULTI-RESERVOIR WATER RESOURCES

Texas Univ., Austin. Center for Research in Water Resources.

W. S. Butcher, and A. Sundar.

w. S. Butcher, and A. Sundar. Available from National Technical Information Service as PB-227 939 \$3.75 in paper copy, \$1.45 in microfiche. Supplement to Technical Report HYD-19-7301, CRWR-100, (October 1973), 60 p. OWRR B-096-TEX(3).

Field 4—WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A-Control Of Water On The Surface

Descriptors: *Computer programs, *Dynamic programming, Optimization, *Programming guages.

See W74-04314. W74-04315

MULTIPURPOSE RESERVOIRS AND URBAN

MULTIPURPOSE RESERVOIRS AND URBAN DEVELOPMENT, North Carolina Univ., Chapel Hill. Center for Urban and Regional Studies. For primary bibliographic entry see Field 6B. W74-04319

MATHEMATICAL MODELING FOR STATUS PREDICTION AND CONTROL OF WATER DIS-

TRIBUTION SYSTEMS,
General Electric Co., Philadelphia, Pa.
H. D. Gilman, M. Y. Goodman, R. DeMoyer, and

I V Radzinl

Available from National Technical Information Service as PB-227 919 \$4.00 in paper copy, \$1.45 in microfiche. Research Report, (1973). 8 p, 1 fig, 4 ref. OWRR C-3166(3734)(3).

*Water distribution(Applied), Descriptors: *Control systems, *Water districts, *Regression analysis, Model studies, *Computer models. Logging(Recording), Simulation analysis, Head loss, Pumps, Tanks, Flow, Systems analysis, *Pennsylvania, Mathematical models.

Identifiers: Network models, Pumping stations, *Philadelphia(Pa.), Load control center.

This study is concerned with the investigation and development of computer methodologies and soft-ware which lead to the eventual 'closed loop control' or computer assisted-supervisory control of water distribution systems. The two approaches to mathematical modeling currently being investigated are the traditional network model and a regression model; both are discussed and com-pared in detail in the context of water distribution system control. The network model comprises the usual flow-head representations of the system's individual elements—pipes, pumps, and tanks; these elements are defined in the standard manner for a Hardy Cross network balance. The water distribution regression model is a set of quasi-empirical mathematical expressions relating important variables, particularly those associated with conrol, such as pumping station head or tank level. One of Philadelphia's water distribution districts was used as a test bed for the research. The district—the Torresdale High Service - Fox Chase Booster District-comprises 27 square miles with elevations ranging from 100 to 265 feet and is fed by two pumping stations separated by a distance of five miles, which ride on two different tank fields six miles away. The pumping stations are regulated by a load control center which has data beging and supervise cost of corbolities (Pall logging and supervisory control capabilities. (Bell-W74-04320

HURRICANE TIDE PREDICTION FOR NEW

YORK BAY, Texas A and M Univ., College Station. Dept. of Oceanography and Meteorology. For primary bibliographic entry see Field 2L. W74-04343

PERMAFROST CONSIDERATIONS IN LAND USE PLANNING MANAGEMENT. Bureau of Land Management, Anchorage, Alaska. For primary bibliographic entry see Field 2C.

INSTITUTIONAL FRAMEWORK AFFECTING THE USE OF INLAND WETLANDS IN MAS-

SACHUSETTS, Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.
T. R. Gupta, and J. H. Foster.

Available from the National Technical Information Service as PB-228 134 \$4.75 in paper copy, \$1.45 in microfiche. Publication No 91, Cooperative Extension Service, USDA-University of Massachusetts, Amherst, 1973. 39 p, 4 tab, 16 ref, append. OWRR B-023-MASS(9), 14-31-0001-3596.

Descriptors: *Wetlands, Economics, Institutions, *Institutional constraints, Northeast U.S.,
*Massachusetts, *Land use, Legislation, Taxes,
*Regional economics, Cities, Planning, Preservation, Leases, Bond issues, Market value, Land management.

Identifiers: *Ownership costs.

The relationship between wetlands and man, as conditioned primarily by the institutional considerations, is discussed. Emphasis is on the description of forces affecting wetland usage and the social value of such lands. Forces studied include the laws governing wetland usage; nature of ownership; ownership costs such as taxes; and goals and plans of the owners of wetlands. Also considered are the activities of groups such as real estate dealers, and construction firms, and the influence of public opinion. The study is based on the survey of wetlands in fourteen Massachusetts towns and cities. Specific recommendations are made for more comprehensive land use legislation; election and composition of municipal conserva-tion commissions; regional rather than local approach to conservation; wetland protection by delineation of boundaries and planned preserva-tion measures; acquisition of wetlands through installment bonds purchase or public lease programs; and taxation exemption for wetlands based on 100% market value of lands. (Larson-Maseachusette) W74-04462

THE RAJASTHAN CANAL AREA: A SETTLE-

MENT STRUCTURE,
Delhi Univ., New Delhi (India). School of
Planning and Architecture. For primary bibliographic entry see Field 6D. W74-04499

CAPITALIZATION OF THE BENEFITS OF WATER RESOURCE DEVELOPMENT,

Kansas Univ., Lawrence. For primary bibliographic entry see Field 6B. W74-04501

LAND VALUE INCREMENTS AS A MEASURE OF THE NET BENEFITS OF URBAN WATER SUPPLY PROJECTS IN DEVELOPING COUNTRIES: THEORY AND MEASUREMENT,

Maxwell Graduate School of Citizenship and Public Affairs, Syracuse, N.Y. Metropolitan and Regional Research Center. For primary bibliographic entry see Field 6B.

W74-04502

CENTO SEMINAR ON THE APPLICATION OF REMOTE SENSORS IN THE DETERMINATION

DE NATURAL RESOURCES.
Central Treaty Organization, Ankara (Turkey).
For primary bibliographic entry see Field 7B.
W74-04567

WATER PROBLEMS OF THE TISZA RIVER IN HUNGARY AND COOPERATION AMONG TISZA BASIN COUNTRIES IN THE FIELD OF WATER MANAGEMENT (VODNYYE PROBLE-MY REKI TISY V VENGRII I SOTRUD-NICHESTVO STRAN BASSEYNA TISY V OBLASTI VODNOGO KHOZVAYST VA),

Vodnyye Resursy, No 3, p 3-22, 1973. 12 fig, 4 tab,

Descriptors: *River basins, *Watersheds(Basins), *Watershed management, *Water manage-

ment(Applied), Flood control, Irrigation operation and maintenance, Reservoir operation, Water resources, Water demand, Water supply, Water utilization, Water quality, Maps.
Identifiers: USSR, "Hungary, "Tisza River.

The Tisza River--the largest left-bank tributary of the Danube--flows through the Soviet Union, Ru-mania, Czechoslovakia, Hungary, and Yugoslavia. The area of the Tisza drainage basin is 157,000 sq Ine area of the 1isza drainage basin is 157,000 km, and the length of the river is about 1,000 km. Orographically, the river basin is divided into two parts: the mountainous part (absolute elevation-1,800-2,000 m), and the lowland part (elevation-200 m; area-80,000 sq km). Droughts, flood damage, and lack of satisfactory sites for storage reservoirs are typical of the Hungarian part of the Tisza basin and determine the magnitude of the basin's water management problems. To resolve these problems, plans are underway to strengthen levees, improve channel conditions of the Tisza River, and construct new reservoirs in different parts of the basin. Basic characteristics of the water regime of rivers in the Tisza basin and effects of human activity on it are discussed, and expansion of international cooperation among socialist countries in developing the water management of the Tisza basin is urged. (Josefson-USGS)

TOPOLOGY OF RIVER SYSTEMS TOPOLOGY OF RIVER STSTEMS AND HYDROGRAPHIC INDICATOR STUDIES (TOPOLOGIYA RECHNYKH SISTEM I GIDROGRAFICHESKIYE INDIKATSIONNYYE ISSLEDOVANIYA), For primary bibliographic entry see Field 2A. W74-04578

RESERVOIRS OF EUROPE AND SOME ASPECTS OF THEIR CONSTRUCTION AND USE (VODOKHRANILISHCHA YEVROPY I NEKOTORYYE VOPROSY IKH SOZDANIYA I KOMPLEKSNOGO ISPOL'ZOVANIYA),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.

For primary bibliographic entry see Field 8A. W74-04582

EFFECT OF THE FOREST ON THE DISPLACE-MENT OF THE DESNA RIVER BED AND THE SIGNIFICANCE OF THIS EFFECT ON FOREST PLANTING IN THE FLOODPLAIN, (IN RUS-SIAN), L. V. Lesovskaya.

L. V. Lesovskaya.
Lesovod Agrolesomelior Resp Mezhved Temat
Nauchn Sb. 20. p 120-125, (1970).
Identifiers: Conversion, *Desna River bed, Displacement, *Erosion, Europe, *Floodplains,
*Forest planting, Land, Plantation, *River beds.

Regularities were revealed in the influence of the riverrain forests on the development of meanders and the magnitude of the conservation of the floodplain lands. No aging of meanders occurs in the zones of influence of the forest meander. Pecularities of the development of meander systems are singled out according to their position. in relation to the afforested area. The results obtained are of a theoretical interest and have a practical significance for establishing the most rational arrangement of riverrain plantations, as well as for calculating the speed of river bed erosion of the Desna River type of floodplain.--Copyright 1973, Biological Abstracts, Inc. W74-04641

OBSERVATIONS ON THE VEGETATION OF THE KORONOWO RESERVOIR, Nicolas Copernicus Univ. of Torun (Poland). Inst.

of Biology. For primary bibliographic entry see Field 2I. W74-04654

WATER QUANTITY MANAGEMENT AND CONTROL-Field 4

Groundwater Management—Group 4B

DEATH OF THE MARSHES IN THE ARDENNES, C. Dauphin.

Entomologiste. Vol 28, No 4/5, p 104-105. 1972. Boloria-aquilonaris, Identifiers: France(Ardennes plateau), Gentiana-pneu-monanthe, Lycaena-Helle, *Marshes, Osmunda-regalis, Oxycoccus-palustris, Proclossiana-eu-nomia, Trientalis-europaea, Vacciniumuliginosum, Vaccinium-vitis-idaea, *Endangered species, *Commercial development, *Drainage.

The marshes north of Charleville-Mezieres in the French plateau of the Ardennes along the Belgian frontier are being drained to give way to commercial development. The already endangered fauna and flora is progressively disappearing including the rare Lepidoptera Lycaena helle, Proclossiana eunomia, and Boloria aquilonaris and the plant species Oxycoccus palustris, Vaccinium vitis idaea, V. uliginosum, Osmunda regalis, Gentiana pneumonanthe and Trientalis europaea.—Copyright 1973. Biological Abstracts, Inc. W74-04686

EFFECT OF LONG-TERM APPLICATION OF VARIOUSLY HIGH RATES OF NUTRIENTS ON NATURAL GRASSLAND SWARDS.

O. Tomka, and E. Lihan.

Ved Pr Vysk Ustavu Luk Pasienkov Banskej Bystrici. 8: p 21-31. 1972. Illus. (English summary). Identifiers: Agropyron-repens, Alopecurus-pratensis, Crop, *Grasslands, *Legumes,

pratensis, Crop, *Grasslands, *Legumes, Nitrogen, *Nutrients, Phosphorus, Production rates, *Swards. *Legumes,

The nutrient rates were 50-250 kg N/ha in 2 different ratios of N:P:K. When 100 kg N/ha was applied the legumes disappeared from the sward. At 100 kg/ha and above, Alopecurus pratensis increased on valley meadows, in a hill-land region on soils with an unstable water regime. After 8-10 yr, growth of Agropyron repens started on all locations. The production on meadow crops increased up to the highest application rate. With higher rates of P and N the yield increased only slightly.—Copyright 1973, Biological Abstracts, Inc. W74-04693

PRODUCTION ABILITY OF LEGUMES, GRASSES AND THEIR MIXTURES IN HILL-LAND REGIONS,

J. Kasper. Ved Pr Vysk Ustavu Luk Pasienkov Banskej Bystrici. 8: p 71-81. 1972. (English summary).

Identifiers: Climates, Dactylis-glomerata,

*Grasses, Hill lands, *Legumes, Lotus-corniculatus, Medicago-sativa, Mixtures, Moisture,

*Production, Trifolium-pratense, *Nitrogen, *Nutrients.

The productivity of different legume-grass mixtures and monocultures of legumes (Trifolium pratense, Medicago sativa, Lotus corniculatus) and grasses (Dactylis glomerata) was investigated at different levels of N nutrition (0, 20, 50, 100, 150, 200 kg/ha pure nutrients). Legume-grass mix-tures provided higher yields of dry matter than the monocultures of legumes. Orchard grass was a strong competing species; itjprevented the encroachment of weeds. Its proportion rose from 10-16% (first utility yr) to 64-76% (sixth utility yr). Cultivation of monoculture grass stands justified only at an application rate not lower than 200 N. At lower rates the legume-grass mixtures provided a higher production. The production potential was strongly influenced by climatic and moisture conditions. Monoculture grass swards at higher rates of N provided more balanced and secure yields than legume-grass swards rich in legumes.—Copyright 1973, Biological Abstracts, W74-04694

POWER LAW DEPENDENCE ON TIME OF RIVER FLOOD DECAY AND ITS RELATION-SHIP TO LONG-TERM FREQUENCY DISTRIBUTION.

California Univ., Los Angeles. Dept. of Planetary

and Space Science.
G. Schubert, and R. E. Lingenfelter.

Water Resources Research, Vol 10, No 1, p 98-102, February 1974. 4 fig, 1 tab, 5 ref. NASA Grant NGL 05-003-404.

Descriptors: *Flood forecasting, *Recession curves, *Flood frequency, Probability, Streamflow forecasting, Hydrograph analysis, Duration

River discharge frequency distributions, based on long-term records of daily streamflow, often have an inverse power law dependence on discharge. This reflects the recession of individual river floods, which have an inverse power law dependence on time with an exponent of 1/(s + 1), where s is the slope of the power law dependence on discharge of the river discharge frequency distribution. This relationship allows forecasting of river discharges with about 5% uncertainty for as much as 30 days after flood peaks. (Knapp-USGS) W74-04806

VERIFICATION OF WATER TEMPERATURE FORECASTS FOR DEEP, STRATIFIED RESER-

Oregon State Univ., Corvallis. School of Oceanography. W. V. Burt.

Water Resources Research, Vol 10, No 1, p 93-97, February 1974. 4 fig, 11 ref.

Descriptors: *Water temperature, *Reservoirs, *Thermal stratification, Forecasting, Climatology, Heat budget, Discharge(Water), Northwest U.S.

Systems are available for forecasting downstream water temperatures for water passing through manmade impoundments. Two forecasts were made for deep, stratified reservoirs in the Northwest. The forecasts were made before the dams had been constructed. Water temperature observations made below the dams after they were constructed are compared with the original forecasts. In both cases the forecasts agreed very well with the observations. A forecast for a high dam and a reservoir with near-surface outlets is also compared with observed temperatures, but this agreement is not as good as that for the reservoirs with low outlets. (Knapp-USGS) W74-04807

A STUDY ON THE ACCURACY OF RUNOFF ANALYSIS FOR PUMPING DRAINAGE IN PADDY FIELD AREA (IN JAPANESE), Shimane Univ., Matsue (Japan). Faculty of

Agriculture. R. Tanaka.

Bull Fac Agric Shimane Univ. 5. p 71-75, 1971,

Illus, English summary. Identifiers: *Drainage, *Paddy field, Pumping, Runoff analysis, *Hydrographs.

In a paddy field area, a runoff hydrograph under rainstorm usually tends to have an extremely smooth shape and long period of runoff because of storage and flood. Therefore, the unit time and the basic rainfall to be used for runoff analysis of pumping drainage should be decided after general consideration based on these characteristics. Investigations in a paddy field area of Anba river near Lake Shinji, Shimane Prefecture (Japan), indicated the reasonable unit time for runoff analysis is about 6 hr and a 3-day storm should be used as the basic rainfall.—Copyright 1973, Biological Abstracts, Inc.

UTILIZATION OF NUTRIENTS FROM SOIL AND FERTILIZERS BY PASTURE GRASS AS DEPENDENT ON SOIL MOISTURE (IN RUS-

SIAN), N. P. Nasonova.

Agrokhimya. 4. p61-65, 1972. Identifiers: *Fertilizers, Irrigation, Moisture, Nitrates, *Nutrients, *Pasture grass, Soils, Potas-sium, Phosphorus.

Application of NH4NO3 to irrigated and non-ir-Application of NH4NO3 to irrigated and non-irrigated soils low in N increased significantly the utilization of fertilizer P and K by the plants. Nutrient utilization sharply increased with irrigation.—Copyright 1973, Biological Abstracts, Inc. W74-04820

4B. Groundwater Management

STUDIES ON THE VALIDITY OF DARCY'S AW FOR FLOW IN NATURAL SANDS, Georgia Univ., Athens. Dept. of Geology. For primary bibliographic entry see Field 2F. W74-04307

SOUTHWESTERN GROUNDWATER LAW: A TEXTUAL AND BIBLIOGRAPHIC IN-TEXTUAL AND TERPRETATION.

Arizona Univ., Tucson. Office of Arid Lands Stu-

J. R. Chalmers.

Available from the National Technical Informa-tion Service as PB-228 130, \$6.00 in paper copy, \$1.45 in microfiche. Arid Lands Resource Information Paper, No. 4, 1974. 229 p, 18 fig. 10 tab, 1 map, 180 ref. OWRR W-161 (No 9071) (1). 14-31-0001-9071.

Descriptors: *Groundwater, *Judicial decisions, *Legal aspects, *Southwest U.S., *Water law, Arizona, California, Colorado, Nevada, New Mexico, Texas, Utah, *Bibliographies, Conjunctive use, Groundwater mining, Institutional constraints, Irrigation water, Overdraft, Pumping, *Prior appropriation, Reasonable use, Surfacegroundwater relationships, *Water rights, Water allocation(Policy), Water management(Applied), Water resources development.

Identifiers: Correlative rights, English rule, Agricultural use of water, Critical groundwater

An attempt is made to bring together up-to-date information on the interpretation of groundwater law doctrines and applied water management poli-cies in the southwestern states of Arizona, California, Colorado, Nevada, New Mexico, Texas, and Utah, where none is able to meet present water de-mand from surface supplies. The resulting mining of groundwater, largely to meet irrigation needs, is creating a critical situation that each of the states covered seeks to meet in a variety of ways. The doctrines of correlative rights, the English common law, prior appropriation and its contemporary modifications, are discussed, state by state. While Arizona has been selected to serve as a case study to put the problem of a diminishing groundwater supply in perspective, there is also a chronological survey of the development of groundwater rights law for each of the states. A final chapter deals with the concept of a statutory revision of Arizona's code, with a modified prior appropriation doctrine recommended. Appended is a 180-item computerized annotated bibliography. (Paylore-Arizona)

W74-04460

THE NEED OF GEOLOGICAL INVESTIGA-TIONS FOR THE DEVELOPMENT OF THE GROUND WATER RESOURCES OF THE REPUBLIC OF KOREA, Geological Survey, Reston, Va. Water Resources

J. T. Callahan, and Il Choi Seung.

Field 4—WATER QUANTITY MANAGEMENT AND CONTROL

Group 4B—Groundwater Management

Journal of the Geological Society of Korea, Vol 9, No 1, p 24-29, March 1973.

Descriptors: *Geologic mapping, *Hydrogeology, *Exploration, *Foreign research, *Groundwater, Mapping, Data collections, Hydrologic data. Identifiers: *Republic of Korea.

The exploration for and inventory of the ground-water resources of Korea should be based on geologic maps of scale ranging from 1:50,000 to 1:10,000. The different rock formations must be delineated and classified according to the depth of well drilling needed, the yield of the rocks to wells, and the chemical quality of the contained groundwater. The investigation of the groundwater resources of Korea has only begun. The work necessary to fully define and develop the resources will require the efforts of many geologists during the coming three decades. (Knapp-USGS) W74-04466

HYDROGEOLOGIC CHARACTERISTICS OF THE SURFICIAL AQUIFER IN NORTHWEST HILLSBOROUGH COUNTY, FLORIDA, Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 2F. W74-04468

EVALUATION OF THE GROUND-WATER SUPPLY AT EIGHT SITES IN GLACIER NATIONAL PARK, NORTHWESTERN MONTANA, Geological Survey, Helena, Mont. For primary bibliographic entry see Field 2F. W74-04469

A PROPOSAL FOR THE INVESTIGATION OF POSSIBLE GROUND-WATER CONTAMINA-TION IN THE BANGOR AREA, KITSAP COUN-TY, WASHINGTON. Geological Survey, Tacoma, Wash. For primary bibliographic entry see Field 5B.

RECONNAISSANCE OF THE GROUND-WATER RESOURCES OF CIMARRON COUNTY. OKLAHOMA.

Geological Survey, Washington, D.C.
D. B. Sapik, and R. L. Goemaat.
For sale by U.S. Geological Survey 20242, Price \$1.25 per set. Hydrologic Investigations Atlas HA-373, 1973. 3 sheets, 3 map, 1 tab, 17 ref.

*Groundwater Descriptors: resources. Descriptors: "Groundwater resources, "Hydrogeology, 'Aquifer characteristics, 'Water quality, "Oklahoma, Water utilization, Irrigation, Water supply, Water wells, Water level fluctua-tions, Water yield, Groundwater recharge, Water analysis, Chemicals, "Mapping, Geology, Hydro-graphs Hydrologic data." graphs, Hydrologic data.
Identifiers: Cimarron County(Okla).

Groundwater resources are described for Cimar-Groundwater resources are described for Cimar-ron County in the Okfahoma Panhandle. The coun-ty depends almost entirely on groundwater for its water supply. Where present, the Ogalala Forma-tion is the principal aquifer. The western half of the county is also underlain by the Dakota Sandstone and the Cheyenne Sandstone Member of the Purgatoire Formation, both of which may yield enough water for irrigation. As a result of accelerated development of groundwater for irrigation that began in 1955, water levels in the Ogallala have declined in a few areas of the county. During 1966 about 70,300 acres were irrigated with groundwater. Assuming an average application of 1.2 acre-feet per year per acre, groundwater pumpage for irrigation during 1966 was estimated to be 80,000 acre-feet. This estimate illustrates the magnitude of increase in pumpage over the 175 acre-feet per year estimated for 1938-40. In some parts of Cimarron County the dissolved-solids and fluoride content of groundwater exceed standards

set by the U.S. Public Health Service for domestic use. (Woodard-USGS) W74-04495

COMMUNITY WATER SUPPLY.

Agency for International Development, Washington, D.C. Office of the War on Hunger. Bibliography Series: Health No. 1, July 15, 1969.

*Bibliographies, Descriptors: retrieval, Planning, *Water supply, Groundwater, Wells, Construction, Management, Materials, Design, Training, Waste water treatment, *Public

Identifiers: *Rural water supply, *Urban water supply, Small wells manual.

This bibliography of 58 items is a guide to community water supply oriented publications of the Agency for International Development (AID) and other agencies working in the field of development assistance. All documents can be obtained at the AID Reference Center. Entries are referenced by subject and program level. Entries by subject insubject and program level. Entries by subject in-clude: Construction; Ground Water; Health Aspects of Water; Management; Materials and Equipment; Planning; Research; Rural Water Supply; Systems Design; Training; Urban Water Supply; and Waste Water Treatment. Listings by program level are divided into Worldwide Programs, Regional Programs, and individual Country Programs. All materials are cross referenced. (Hoffman-North Carolina)

ECONOMIC ASPECTS OF GROUND WATER RESOURCES AND REPLACEMENT FLOWS IN SEMIARID AGRICULTURAL AREAS,

New Mexico Univ., Albuquerque. M. Gisser, and A. Mercado. American Journal of Agricultural Economics, Vol 55, No 3, p 461-466, August 1973. 2 fig, 14 ref.

*Groundwater Descriptors: Descriptors: "Groundwater management, 'Irrigation water, 'Project planning, 'Economic feasibility, 'Water demand, Hydrologic aspects, 'Semiarid climates, Agriculture, Aquifers, Artificial recharge, Alternative planning, Costs, Mathematical models, Systems analysis, Profit, Optiminum development plans. management. Identifiers: *Replacement flow.

In semiarid areas where farmers are faced with falling water tables, hydrology and economics must be combined in an integrated model. A single cell hydrologic model of an aquifer in a semiarid region is integrated with an agriculture (linear) negatively sloped demand function for irrigation water. Groundwater and replacement flow are charged artificially into the ground. The aquifer benefits from a significant natural recharge and loses water via natural discharge, which is functionally related to water level. Concern is with the long-run steady-state solutions characterized by eventual equilibriim in which, if necessa an eventual equilorism in which, it necessary, with the help of artificial recharge, overdraft; reduced to zero. Essentially, the economic problem is to select the replacement flow project that will leave the farm with the maximum profit (net income) and an aquifer that is in steady state. Given pumping and replacement flow costs, only one project (as proposed to a variety) yields simulone project (as proposed to a variety) yields simultaneously maximum profit and steady-state solution. The model presented can aid policy makers in solving problems from overdraft leading to a falling water table and in examining the profitability of importing water from surplus areas and artificially recharging the aquifer. (Bell-Cornell) W74-04563

POSSIBLE APPLICATION OF REMOTE SENSING FOR UNDERGROUND WATER EXPLORATION IN TURKEY, State Hydraulic Works, Ankara (Turkey). Dept. of Hydrographic Mapping and Photo Geology. For primary bibliographic entry see Field 7B.

W74-04568

INVESTIGATION GROUNDWATER AND MANAGEMENT IN IRAN,

Ministry of Water and Power, Tehran (Iran). For primary bibliographic entry see Field 7B. W74-04569

WATER RESOURCES APPLICATIONS, Geological Survey, Rolla, Mo. Water Resources For primary bibliographic entry see Field 7B. W74-04584

GROUND WATER AND THE GEOTHERMAL RESOURCE.

Geraghty and Miller, Port Washington, N.Y. Special Report, September 1973. 14 p, 8 fig.

Descriptors: *Geothermal studies, *Thermal water, Thermal springs, *Reviews, Heat flow, Thermal power, *Groundwater. Identifiers: *Geothermal power.

Groundwater is one of the two basic ingredients in the geothermal energy resource. Most of the hot waters and steam in known geothermal systems are of meteoric origin and not produced from mag-mas as had been thought previously. Thus, the water involved is ordinary groundwater and the quantity available in a geothermal system is deter-mined by the same geologic factors that control the occurrence and movement of all subterranean waters. Heat is the other basic ingredient and its position and quantity in relation to the available groundwater determines the character of the geothermal resource and eventually its usefulness to man. (Knapp-USGS)
W74-04586

AVAILABILITY OF GROUND WATER IN THE

WINNSBORO AREA, LOUISIANA, Geological Survey, Baton Rouge, La. M. S. Whitfield, Jr. Louisiana Department of Public Works Water Resources Special Report No 1, December 1973. 9 p, 1 fig, 1 plate, 2 tab.

Descriptors: *Groundwater, *Water quality, *Louisiana, *Iron, Hardness(Water), Water yield, Withdrawal, Water levels, *Alluvial aquifers, *Chlorides. Identifiers: Winnsboro(La).

Sand and gravel deposits of the Mississippi River alluvial aquifer are 80-100 feet thick in the Winnsboro area of Louisiana and yield as much as 4,000 gallons of water per minute. In most of the area the groundwater is hard to very hard and has a high iron concentration. Chloride concentrations have iron concentration. Chiorine concentrations have increased from 62 mg per liter in early 1960 to 436 mg per liter in October 1973. This change is apparently related to increased pumpage in the Winnsboro well field over the past 20 years. (Knapp-USGS) W74-04596

A DESIGN PROCEDURE FOR THE CONJUNC-TIVE USE OF SURFACE AND GROUNDWATER

STORAGES, New South Wales Univ., Kensington (Australia). P. R. Johnston, E. M. Laurenson, and D. T. Howell.

Australian Water Resources Council Technical Paper No 3, 1973. 40 p, 16 fig, 4 tab, 2 map, 33 ref. Research Project 68/12.

Descriptors: *Conjunctive use, *Water storage, *Australia, *Dynamic programming, *Surfacegroundwater relationships, Water yield, Planning, Water resources development, Water management(Applied), *Optimum development plans, Design criteria.

WATER QUANTITY MANAGEMENT AND CONTROL—Field 4

Effects On Water Of Man'S Non-Water Activities—Group 4C

A procedure was developed for determining the optimum development for surface water and groundwater in a valley. The optimum size for the surface reservoir, the required number of bores or wells, and sizes of other components were deter-mined in the Upper Hunter Valley, New South Wales, Australia. The procedure was based on the use of dynamic programming. The procedure could be used for the design of a system required to satisfy either an agricultural or urban demand. It could also be used as part of a procedure to solve a larger problem, where the aim is not merely to larger problem, where the aim is not merely to determine a least cost design for a given target level of water supply, but to decide on an optimal level of water supply to maximize net benefits. Because inadequate data are likely to be available for the design of a new system, the method may find more application in the design of modifications to existing systems. (Knapp-USGS)

GROUND-WATER DATA FOR HARRIS COUNTY, TEXAS: VOLUME I. DRILLERS' LOGS OF WELLS, 1905-71.

Geological Survey, Austin, Tex.
Texas Water Development Board Report 178, November 1973. 421 p, 1 fig, 5 ref.

Descriptors: *Drillers logs, *Data collections, *Water wells, *Hydrologic data, *Texas, Discharge(Water). Identifiers: Harris County(Texas).

The groundwater data-collection program in Harris County, Texas, consists of an inventory of new large-capacity and other selected wells, the collection of water samples from wells for chemical analyses, an inventory of groundwater pumpage, water-level measurements in observation wells, pumping tests on large-capacity wells, and com-pilation of information on land-surface sub-sidence. Drillers' logs of approximately 1,200 wells in Harris County that have been collected as part of the inventory from 1905 to 1971. (Knapp-USGS) W74-04602

HYDROLOGIC AND GEOLOGIC CONSIDERA-TIONS FOR SOLID-WASTE DISPOSAL IN WEST-CENTRAL FLORIDA,

Geological Survey, Tallahassee, Fla For primary bibliographic entry see Field 5E.

ECONOMIC POWER FROM GEOTHERMAL HEAT, J. H. Anderson.

Reprint: J. Hilbert Anderson - Consulting Engineer, 1615 Hillock Lane, York, Pennsylvania, August 12, 1972, 4 p, 6 fig, 7 ref.

Descriptors: *Electric power production, *Geothermal studies, *Heat transfer, *Heat exchangers, *Design criteria, Heat flow, Gases, Fluids, Heated water, Cost analysis, Construction costs, Well drilling, Feasibility, Waste water disposal, Condensers. Identifiers: Geothermal energy

A discussion of geothermal energy is presented which includes consideration of the possibility for its conversion into electrical energy, different techniques to accomplish such a conversion and the general costs involved. Geothermal energy can be an economical source of power if the heat sources are sufficiently close to the surface to allow reasonably easy access. Methods of bringing this heat to the surface for conversion include heated water flow, flashing of superheated water through a cold water zone, and hot water pumped to the surface in connection with a heat exchanger.
The latter process eliminates the disadvantages of energy loss and corrosion associated with the first two methods. In the process the hot water is pumped to the surface under pressure to prevent it from flashing into steam. The heat is exchanged to another fluid favorable for vaporization, such as isobutane. The cost of energy per kilowatt-hour depends upon the temperature of the well, the depth of the well and the efficiency of the heat transfer process. Enclosed graphs depict costs per depth of drilling wells, a heat transfer schematic, a performance curve for an isobutane cycle and water rates and thermal efficiency. (Jerome-Van-W74-04766

SURFACE- AND GROUND-WATER CONDI-TIONS DURING 1959-61 IN A PART OF FLETT CREEK BASIN, TACOMA, WASHINGTON, Geological Survey, Tacoma, Wash.

For primary bibliographic entry see Field 2E.

THE OPERATION OF A STREAM-AQUIFER SYSTEM UNDER STOCHASTIC DEMANDS, Geological Survey, Reston, Va. T. Maddock, III.

Water Resources Research, Vol 10, No 1, p 1-10, February 1974. 2 fig. 5 tab. 19 ref.

*Conjunctive use. *Stochastic Descriptors: processes, Statistical methods, *Water demand, Water yield, *Surface-groundwater relationships, Artificial recharge, Drawdown, Withdrawal.

It is possible to develop operating rules for the conjunctive use of surface water and groundwater when the demand and supply sources are stochastic. These rules allow the quantities of water pumped from wells, diverted from streams, spread, and returned to the stream after use to be determined for a given time period even if the required needs and availability of supply are un-certain at the beginning of the time period. These rules are dependent on a technological function relating streamflow interaction with well pumping and with the statistics of the demands, stream flow, pumping, and drawdowns. The discounted expected cost and the operating rules are functions of not only the expected value of the demands but also its variance and persistence (as measured by an autocorrelation function). The discounted expected cost has high sensitivity to demand variances and some sensitivity to persistence. (Knapp-W74-04808

4C. Effects On Water Of Man'S Non-Water Activities

ENVIRONMENTAL CONSIDERATIONS FOR THE UTILIZATION OF PERMAFROST TER-

RAIN, Cold Regions Research and Engineering Lab., Hanover, N.H. For primary bibliographic entry see Field 2C. W74-04407

CONTROL OF PERMAFROST DEGRADATION BENEATH A ROADWAY BY SUBGRADE INSU-

LATION, Alaska State Dept. of Highways, College.

In: International Conference on Permafrost 2nd, Yakutsk, USSR 1973. p 608-622, 1973. 10 fig, 1 tab, 8 ref.

Descriptors: *Permafrost, *Subsidence, *Road construction, *Insulation, *Alaska, Thawing, Consolidation, Peat, Frozen soils, Frozen ground, Degradation(Slope).

Newly constructed roadways crossing permafrost terrain originally covered with vegetation have the effect of increasing the amplitude of the seasonal

surface and subsurface temperature variations and also of altering the mean annual surface tempera-ture. Readjusting of the permafrost table to the new thermal conditions occurs over a period of years. Readjustment is accompanied by roadway surface settlement in areas where permafrost degradation occurs in soils having high frozen moisture contents or segregated ice formations or deposits. The Alaska Department of Highways, in 1969, installed two different thicknesses of ex-truded polystyrene foam insulation boards beneath a newly constructed roadway in a region of relatively warm permafrost. Roadway fill sections constructed over a frozen peat subgrade, with both 5.1- and 10.2-cm-thick insulation layers, performed very well during the first 3 years after construction, as evidenced by the fact that surface construction, as evidenced by the fact that surface settlement has been very small and very uniform. Adjacent normally constructed fill sections showed the average settlement to be 8 times greater than the 5-cm insulation section and 11 times greater than the 10-cm section, with severe variations in settlement magnitude. (See also W74-04346) (Knapp-USGS) W74-04409

CONTROL OF CULVERT ICING, Cold Regions Research and Engineering Lab., Hanover, N.H. D. A. Gaskin, and L. E. Stanley.

In: International Conference on Permafrost 2nd, Yakutsk, USSR 1973. p 629-636, 1973. 7 fig, 1 tab,

Descriptors: *Ice, *Culverts, *Drainage, *Arctic, *Deicers, Permafrost, Melting, Heating. Identifiers: *Ice control.

The U. S. Army Cold Regions Research and Engineering Laboratory conducted field and labora-tory studies from 1966 to 1971 as a joint research project with the Alaska Department of Highways and the U.S. Department of Transportation on the prevention and control of culvert and road icing. A laboratory study was made of culvert icing control using electric heat cables. The major heat transfer mechanism for melting and maintaining an open, freely draining hole in a culvert subject to ground-water icing is convection. This implies that the optimum location for the cable is near the bottom of the culvert, where the largest cross-section hole can be melted without thawing the frozen soil that surrounds the culvert. A proportional controller system was useful for spring icing problems. The sensor can be placed downstream of the problem drainage structure and an electric heat cable installed. When the system is energized, it will keep stated. When the system is chergized, it was accept the water continuously flowing through the drainage structure above the freezing point and so minimize or eliminate the culvert icing blockage. (See also W74-04346) (Knapp-USGS) W74-04411

SOME EFFECTS OF SURFACE DISTURBANCE ON THE PERMAFROST ACTIVE LAYER AT INUVIK, N.W.T., CANADA,

Geological Survey of Canada, Ottawa (Ontario). J. A. Heginbottom.

International Conference on Permafrost 2nd, Yakutsk, USSR 1973. p 649-657, 1973. 6 fig, 3 tab,

Descriptors: *Permafrost, *Environmental effects, *Erosion, *Thawing, Canada, Frozen soils, Subsidence, Soil engineering, Soil strength, Soil mechanics.

In permafrost active layer in the forest-tundra environment of northern Canada, the effects of disturbance of the ground surface on the active layer were studied. This information is used in the production of guidelines and regulations to minimize some of the undesirable effects of land use and northern development. The structure of the active layer in this area is an important factor.

The most obvious feature of the ground surface in

Field 4-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4C-Effects On Water Of Man'S Non-Water Activities

the Inuvik area is its hummocky nature. The upper layer of the ground is a complex of mineral soil hummocks separated by shallow, moss-filled trenches. The hummocks are composed of a dense, grey-brown clay-silt, showing little or no soil profile development. In undisturbed areas, some hummocks have mineral soil exposed at the surface, but most are covered with a thin layer (less than 5 cm) of humus, mosses, and lichens. The one factor that overrides all others in con-trolling the effects of any terrain disturbance on the permafrost active layer is the intensity or severity of the original distrubance. Variations in the response of the terrain due to different original terrain conditions are much less. (See also W74-04346) (Knapp-USGS) W74-04413

CORPS OF ENGINEERS TECHNOLOGY RE-LATED TO DESIGN OF PAVEMENTS IN AREAS OF PERMAFROST,
Corps of Engineers, Washington, D.C.

F. B. Hennion, and E. F. Lobacz.
In: International Conference on Permafrost 2nd,

Yakutsk, USSR 1973. p 658-664, 1973. 1 fig, 8 ref.

Descriptors: *Permafrost, *Frost heaving, *Road construction, Design, Thawing, Freezing, Subsidence.

Design of pavements subject to seasonal thawfreeze cycles is based on either of two basic concepts: control of surface deformation resulting from frost action, or provision of adequate bearing capacity during the most critical climatic period. Waterproofing membranes may be used to protect dry high-density fine-grained soil layers from water infiltration and subsequent loss of strength. Membrane encapsulated soil layers (MESL) may be used in permanent pavement systems. In August 1970, an MESL test section was constructed at the Army Cold Regions Research and Engineering Laboratory Alaska Field Station using Fairbanks silt as the embankment encapsulated soil. The section has a length of 76 m, a traffic surface width of 6-6.7 m, and a thickness from 0 to 0.9 m. Both top and bottom membranes are polypropylene waterproofed with a single hand application of about 2.2 cubic decimeters per sq m of emulsified asphalt. The MESL concept appears to be a feasible method of utilizing local, normally unsatisfactory materials as replacements for clean granular base and subbase coarse materials.

Moisture migration in thick silty encapsulated layers presents a design problem; however, this can be minimized by utilizing horizontal moisture barriers (probably formed in place). (See also W74-04346) (Knapp-USGS) W74-04414

PERMAFROST PROTECTION FOR PIPELINES. Esso Production Research Co., Houston, Tex. For primary bibliographic entry see Field 2C. W74-04415

PERMAFROST-RELATED **ENGINEERING** GEOLOGY PROBLEMS TRANS-ALASKA PIPELINE, POSED BY Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 8D.

LONG-TERM EFFECTS OF VEGETATIVE COVER ON PERMAFROST STABILITY IN AN AREA OF DISCONTINUOUS PERMAFROST, Cold Regions Research and Engineering Lab.,

Hanover, N.H. K. A. Linell

In: International Conference on Permafrost 2nd, Yakutsk, USSR 1973. p 688-693, 1973. 4 fig, 2 tab,

Descriptors: *Permafrost, *Subsidence, *Thawing, *Vegetation effects, Forests, Tundra,

*Alaska, Arctic, Frozen soils, Frozen ground, Soil physical properties. Soil mechanics.

The relationship between vegetative cover and permafrost degradation was studied at Fairbanks, Alaska. The data extend through 1972, 26 years after the start of the experiment. The terrain at the station has a comparatively smooth, gentle slope to the west, providing good surface drainage ex-cept at the lowest elevations where swampy conditions exist. The ground under the station manently frozen, with the depth of permafrost ap-proaching 60 m. Only the original densely tree covered section has remained free from per-mafrost degradation. In both the cleared and stripped sections, permafrost degradation is still continuing, though at a distinctly slower rate than in the area that was only cleared. In an environ-ment like that at Fairbanks the maintenance or reestablishment of a random, mixed-type low vegetative cover cannot be counted on to stop or prevent permafrost degradation in an area subject to surface disturbance. (See also W74-04346) (Knapp-USGS) W74-04417

ENCOUNTERING MASSIVE GROUND ICE DURING ROAD CONSTRUCTION IN CENTRAL ALASKA.

Cold Regions Research and Engineering Lab.,

Hanover, N.H. N. Smith, and R. Berg.

In: International Conference in Permafrost 2nd, Yakutsk, USSR 1973. p 730-736, 1973. 17 fig, 4 ref.

Descriptors: *Permafrost, *Road construction, Excavation, *Alaska, Arctic, Thawing, Revegeta-

Several cuts along a new roadway in Central Alaska had exposed massive ice inclusions and wedges. Eight relatively deep cuts were made in high ice content soils. Guidelines are given for making cuts through ice-rich soils: avoid north-facing slopes when possible; make vertical backslopes on cuts; provide a wide ditch at the base of the cut to allow removal of material if necessary to allow deposition of some overlying material during the stabilization process; and clear trees and brush from the top of the slope to a distance about equal to the height of the slope. (See also W74-04346) (Knapp-USGS) W74-04420

THE USE OF POLYURETHANE FOAM PLASTICS IN THE CONSTRUCTION OF EXPEDIENT ROADS ON PERMAFROST IN CEN-

TRAL ALASKA,
Cold Regions Research and Engineering Lab.,
Hanover, N.H.
For primary bibliographic entry see Field 8G.
W74-04421

EFFECTS OF GROUND-ICE VARIABILITY AND RESULTING THAW SETTLEMENTS ON BURIED WARM-OIL PIPELINES,
Mackenzie Valley Pipeline Research Ltd., Calgary

(Alberta).

T. L. Speer, G. H. Watson, and R. K. Rowley In: International Conference on Permafrost, 2nd, Yakutsk, USSR, 1973. p 746-752, 1973. 5 fig, 2 tab,

Descriptors: *Permafrost, *Subsidence, Frozen soils, Soil types, *Canada, Arctic, Frost heaving, Ice, Soil mechanics, *Pipelines, *Oil fields.

Field and laboratory studies were undertaken to determine the type and variability of ground ice occurring in clay and silt permafrost soils and to establish limiting pipe burial criteria. Specific objectives were to derive a general relationship between frozen bulk density and thaw settlement for permafrost mineral soils; to determine the ice variation for specific terrains in which the

proposed pipeline might be buried; to determine the representative potential total and differential settlements for these specific terrains; and to establish a method of using both the frozen bulk density and thaw settlement data (total and dif-ferential) obtained to establish practical design limits for a warm buried pipeline. (See also W74-04346) (Knapp-USGS) W74-04422

STATISTICAL ANALYSIS OF HYDROGRAPH CHARACTERISTICS FOR SMALL URBAN WATERSHEDS, Tracor, Inc., Austin, Tex.

For primary bibliographic entry see Field 2A. W74-04459

EFFECTS OF URBANIZATION ON FLOODS IN THE DALLAS, TEXAS, METROPOLITAN

AREA,
Geological Survey, Austin, Tex.
G. R. Dempster, Jr.
Water-Resources Investigations 60-73, January
1974. 55 p, 10 fig, 11 tab, 11 ref.

Descriptors: *Urban hydrology, *Urban runoff, *Texas, *Mathematical models, Rainfall-runoff relationships, Peak discharge, Regression analysis, Flood frequency. Identifiers: *Dallas(Tex).

The effects of urbanization on flood characteristics of streams in the Dallas metropolitan area were studied by use of a digital model of the hydrologic system. The model was calibrated by using observed rainfall and runoff data from 19 storms in six basins having various degrees of ur-banization. The calibrated models were used with a 57-year rainfall record to simulate 57-year records of annual peak discharges in 14 basins.
The flood-frequency characteristics were defined by fitting the simulated 57-year records to log-Pearson Type III distributions. Regional peak discharge equations, which can be used to determine the maximum rates of discharge that could be mine the maximum rates of discharge that could be expected to be equaled or exceeded on the average of once in 1.25, 2, 5, 10, 25, and 100 years, were derived from multiple-regression analyses. The relationships among flood frequency, drainage area, and a coefficient of impervious area are given in a nomograph. In a fully developed re-sidential area, the flood peaks will be 1.2 to 1.4 times those from an undeveloped area, and the an-nual direct runoff will be about double that from an undeveloped area. (Knapp-USGS) W74-04483

ESTIMATING THE BENEFITS OF STREAM VALLEY AND OPEN SPACE PRESERVATION PROJECTS, Regional Science Research Inst., Philadelphia, Pa.

For primary bibliographic entry see Field 6B. W74-04500

SUMMARY REPORT OF METROMEX STU-DIES, 1971-1972. Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 2B. W74-04509

HYDROLOGIC INVESTIGATION AND DESIGN IN URBAN AREAS—A REVIEW, Snowy Mountains Engineering Corp., Cooma (Australia). For primary bibliographic entry see Field 2A. W74-04597

URBANIZATION: HYDROLOGICAL A HEADACHE, Lund Inst. of Tech. (Sweden). G. Lindh Ambio. Vol 1, No 6, p 185-201. 1972. Illus.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Identification Of Pollutants—Group 5A

Identifiers: Ground water, *Hydrological cycle, Mathematical methods, Statistical studies, *Urbanization, Water balance, *Water quality, *Water quantity.

Urbanization disrupts the natural hydrological cycle and creates problems concerning the quality, quantity and distribution of water. Urbanization causes changes in the microclimate, the ground's hydrological response, the quality and quantity of groundwater, and the water balance. Urbanization often makes it necessary to transfer water from other regions. There is presently a great need for research on urban hydrology. The use of statistical mathematical methods, especially systems analysis, has spurred progress in certain areas of hydrology .-- Copyright 1973, Biological Abstracts, W74-04642

4D. Watershed Protection

WATER PROBLEMS OF THE TISZA RIVER IN HUNGARY AND COOPERATION AMONG TISZA BASIN COUNTRIES IN THE FIELD OF WATER MANAGEMENT (VODNYYE PROBLE-MY REKI TISY V VENGRII I SOTRUD-NICHESTVO STRAN BASSEYNA TISY V OBLASTI VODNOGO KHOZVAYST VA), For primary bibliographic entry see Field 4A.

MUDFLOWS (SELEVYYE POTOKI), Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem. G. D. Rozhdestvenskiy. Vodnyye Resursy, No 3, p 171-174, 1973. 7 ref.

Descriptors: *Mudflows, *Sediment control, Damages, Forecasting, Planning. Identifiers: *USSR.

Mudflows are widespread in many mountainous and piedmont regions of the Soviet Union. Mudflows occur most frequently in the Caucasus, Transcaucasus, Tien-Shan, Karatau, Kopet-Dag, the Baykal region, the Crimea, and the Carpathians. Mudflows also form in the Polar Urals, the Khibiny Mountains and on the Central Siberian Plateau, Sakhalin, and Kamchatka. According to incomplete figures, over 5,000 cases of mudflows have already been recorded in the Soviet Union. In mountainous and piedmont regions of the Cau-casus and Soviet Central Asia mudflows have caused extensive damage to railroads, including the Transcaucasus, Azerbaydzhan, Ashkhabad, Tashkent, and Kazakh lines. Mudflow control is divided into active measures aimed at preventing formation of catastrophic mudflows and passive measures designed to control mudflows by incorporating an additional storage volume in reservoirs for sediment accumulation or by diverting mudflows to areas of lesser economic significance. Mudflow control in the Soviet Union (and abroad) is divided into (1) engineering measures and (2) afforestation and phytomeliorative measures. It is estimated that by 1980 about 670 million rubles will have been spent on combating mudflows and floods in the Soviet Union. Some common features of mudflow deposits and conditions favoring their formation are examined. (Josefson-USGS)

RESPONSE AND RECOVERY OF A PIEDMONT WATERSHED FROM TROPICAL STORM AGNES, JUNE 1972.

Maryland Geological Survey, Baltimore. For primary bibliographic entry see Field 2J. W74-04805

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

A DETAILED INVESTIGATION OF THE SOCIOLOGICAL, ECONOMIC, AND ECOLOGICAL ASPECTS OF PROPOSED RESERVOIR SITES IN THE SALT RIVER BASIN OF KEN-

Kentucky Water Resources Inst., Lexington. For primary bibliographic entry see Field 2A. W74-04310

DETERMINATION OF THE COMPLEXING CAPACITY OF NATURAL WATER, partment of Chemistry.
For primary bibliographic entry see Field 2K.
W74-04312 North Carolina State University at Raleigh. De-

REMOTE SENSING IN SAMPLING SITE LOCA-TION IN LAKES AND STREAMS, Kentucky Univ., Lexington. Dept. of Civil Engineering.
J. D. Womack.

Available from National Technical Information Service as PB-227 846 \$4.00 in paper copy, \$1.45 in microfiche. University of Tennessee Water Resources Research Center Research Report No 37, 1974, 8 p. OWRR A-025-TENN(1). OWRR 14-31-0001-3843.

Descriptors: *Remote sensing, *Aerial photography, *Mapping, *Sampling, Lakes, Streams, Design, *Tennessee, Water quality. Identifiers: *Fort Loudoun Reservoir(Tenn.).

This project was intended to investigate the use of remote sensing techniques in the design of sampling programs on large lakes and streams. The wide overview of aerial photography and infrared thermal mapping scanners provide means of visualizing and measuring variations in water characteristics which might remove the sense of characteristics which might require compensation for representative sampling. Several sites on Fort Loudoun Lake were sampled to determine whether persistent patterns of water quality variations existed. The parameters measured were temperature, measured with a Barnes Radiometer, turbidity and color. Persistent patterns were found in the vicinity of tributary inflows and it was concluded that aerial techniques would be useful in mapping the extent and shape. The Project was terminated before significant aerial imagery could be acquired. W74-04313

ENVIRONMENTAL MONITORING AND DISPOSAL OF RADIOACTIVE WASTES FROM U.S. NAVAL NUCLEAR-POWERED SHIPS AND THEIR SUPPORT FACILITIES, 1972, Department of the Navy, Washington, D.C. For primary bibliographic entry see Field 5B. W74-04441

A HISTORY AND PRELIMINARY INVENTORY REPORT ON THE KENTUCKY RADIOACTIVE WASTE DISPOSAL SITE, Kentucky Dept. of Health, Frankfort. Radiologi-cal Health Program. For primary bibliographic entry see Field 5B. W74-04442

AERIAL RADIOLOGICAL MEASURING SUR-AERIAL RADIOLOGICAL MEASURING SUR-VEY OF THE AREA SURROUNDING THE ROBERT EMMETT GINNA NUCLEAR POWER PLANT, ONTARIO, NEW YORK, SEPT. 8, 1970. EG and G, Inc., Las Vegas, Nev. Available from NTIS, Springfield, Va., as Rept. No. ARMS-70-6-10. \$4.00 per copy, \$1.45 microfiche. Report No. ARMS-70-6-10, October 1973. 18 p, 2 fig, 3 tab, 3 ref.

Descriptors: *Nuclear powerplants, Effluents, Surveys, Measurement, *Radioactivity, Water pollution, Water pollution sources, Air pollution, Fallout, *Lake Ontario, *New York, Food chains, Public health, *Remote sensing.

The Aerial Radiological Measuring System was used to survey the area surrounding the Robert Emmett Ginna Nuclear Power Plant during Sep-tember 1970. The survey measured terrestrial tember 1970. The survey measured terrestrial gamma radiation. A high-sensitivity detection system collected gamma ray spectral and gross count data. The data were then computer processed into a map of a 325-square-mile area showing isoexposure contours three feet above the ground. Exposure rates and isotopes identified are consistent with normal background radiation. (Houser-ORNL) W74-04446

AERIAL RADIOLOGICAL MEASURING SUR-VEY OF THE AREA SURROUNDING THE LA CROSSE BOILING WATER REACTOR, GENOA, WISCONSIN, JULY 1968.

GENDA, WISCONSIN, JULY 1965. EG and G, Inc., Las Vegas, Nev. Available from NTIS, Springfield, Va., as Report No. ARMS-68.6.5. \$4.00 per copy, \$1.45 microfiche Report No. ARMS-68.6.5 (EGG-1183-1584), October 1973. 17 p, 2 fig, 3 tab, 3 ref.

Descriptors: *Monitoring, *Nuclear powerplants, Effluents, Surveys, Measurement, Water pollution, *Radioisotopes, Air pollution, Fallout, Food chains, Milk, Dairy industry, *Mississippi River Basin, Public health, *Wisconsin, *Remote Identifiers: *Boiling water reactor.

The Aerial Radiological Measuring System was used to survey the area surrounding the La Crosse Boiling Water Reactor during July 1968. The survey measured terrestrial gamma radiation. A highsensitivity detection system collected gamma-ray spectral and gross-count data. The data were then computer processed into a map of a 625-square-mile area showing isoexposure contours three feet above the ground. Exposure rates and isotopes identified are consistent with normal background radiation. (Houser-ORNL)
W74-04447

AERIAL RADIOLOGICAL MEASURING SUR-AERIAL RADIOLOGICAL MEASURING SUR-VEY OF THE AREA SURROUNDING THE VER-MONT YANKEE GENERATING STATION AND THE YANKEE NUCLEAR POWER STATION, SEPTEMBER 18, 1970. EG and G, Inc., Las Vegas, Nev. Available from NTIS, Springfield, Va., as Rept. No. ARMS-70.6.11. \$4.00 per copy, \$1.45 microfiche. Report No. ARMS-70.6.11 (EGG-1183-1581), October 1973. 30 p, 12 fig, 5 tab, 5 ref.

Descriptors: *Nuclear powerplants, Effluents, *Radioactivity, *Surveys, Measurement, Monitor-ing, *Vermont, Massachusetts, Air pollution, Water pollution sources, Fallout, Food chains, Public health, *Remote sensing.

Identifiers: Deerfield River, Ashuelot River, *Boiling water reactor, Pressurized water reactor.

The Aerial Radiological Measuring System was used to survey the area surrounding the Vermont Yankee Generating Station and the Yankee Nuclear Power Station during September 1970.
The survey measured terrestrial gamma radiation.
A high-sensitivity detection system collected spectral and gross-count data for the flyable portions of the 625-square-mile survey area, Isotopes identified and exposure rates are consistent with normal background radiation. (Houser-ORNL) W74-04448

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5A—Identification Of Pollutants

AERIAL RADIOLOGICAL MEASURING SUR-VEY OF THE AREA SURROUNDING THE POINT BEACH NUCLEAR PLANT, TWO CREEKS, WISCONSIN, AUGUST 16 AND 17,

EG and G. Inc., Las Vegas, Nev. Available from NTIS, Springfield, Va., as Rept. No. ARMS-70.6.9. \$4.00 per copy, \$1.45 microfiche. Report No. ARMS-70.6.9 (EGG-1183-1587), October 1973. 18 p, 2 fig, 3 tab, 3 ref.

Descriptors: *Monitoring, *Nuclear powerplant, Effluents, *Radioactivity, Air pollution, Water pollution, Fallout, *Wisconsin, Surveys, Measurement, Instrumentation, *Lake Michigan, Public health, *Remote sensing.

The Aerial Radiological Measuring System was used to survey the area surrounding the Point Beach Nuclear Plant during August 1970. The survey measured terrestrial gamma radiation. A highsensitivity detection system collected gamma-ray spectral and gross-count data. The data were then computer processed into a map of a 312-square-mile area showing isoexposure contours three feet above the ground. Exposure rates and isotopes identified are consistent with normal terrestrial background. (Houser-ORNL) W74-04449

ENVIRONMENTAL RADIOACTIVITY. For primary bibliographic entry see Field 5B.

APPROACHES TO STORMWATER MANAGE-

MENT, Hittman Associates, Inc., Columbia, Md B. C. Becker, M. L. Clar, and R. R. Kautzman. Available from the National Technical Informa-tion Service as PB-228 124, \$6.75 in paper copy, \$1.45 in microfiche. Completion Report, HIT-563, November 1973 .258 p, 66 fig, 17 tab, 90 ref. OWRR C-4140(No 9025) (1).

Descriptors: *Storage, *Storm runoff, *Flood con-Descriptors: Storage, Storage and Turbol, "Polection reservoirs, "Water pollution control, "Design storm, Flood routing, Watershed management, Design criteria, Reviews, Bank storage, Reservoir storage, Underground storage flood hydrology, Urbanization, Retention reservoire Ferring control Flood damage.

voirs, Erosion control, Flood damage. Identifiers: *Stormwater management, Storm water detection/retention.

The literature was searched to identify the various techniques, past and present, utilized for the control of stormwater management. Fifteen different basic techniques for stormwater management were selected and grouped under 3 categories: surface detention, subsurface detection, and infiltration systems. The presentation includes a description of the technique, a discussion of its applica-bility, an example of an actual application where available, and a brief review of the available design, maintenance and construction considerations. Needs for planning, design, maintenance and institutional considerations of stormwater management, are described. W74-04458

MASS SPECTROMETRY AND INHOMOGENE-OUS ION OPTICS,

Rensselaer Polytechnic Inst., Troy, N.Y. F. A. White.

Available from NTIS, Springfield, Va 22151 NASA CR-2253 Price \$4.50 (domestic), \$7.00 (foreign); \$1.45 microfiche. National Aeronautics and Space Administration Contractor Report CR-2253, November 1973. 127 p, 47 fig, 1 tab, 30 ref. NASA Contract NGL 33-018-053.

Descriptors: *Mass spectrometry, *Pollutant identification, Heavy metals, Trace elements, *Analytical techniques, Ions, Air pollution, Water pollution, Oxides, *Ionization, *Isotope fractiona-

Identifiers: *Metallic oxides.

Magnetic mass spectrometers were studied for use in measuring air and water pollution. The calcula-tions and data necessary for the design of inhomogeneous field mass spectrometers, and the calculation of ion trajectories are presented. Solid state ion detection devices were tested for capa-bility of counting single ions. New techniques in the preparation and operation of thermal-ioniza-tion ion sources are described. Data were obtained on the concentrations of copper in rainfall and uranium in air samples using the improved thermal ionization techniques. A closed system static mass spectrometer was designed for isotopic analyses. Instrumental aspects of a four-stage mass spectrometer comprising two electrostatic and two 90 deg magnetic lenses with a 122-cm radius used to study the interaction of ions with solids are summarized. (Knapp-USGS)

EVALUATION AND SIMULATION OF CHEMI-CAL-QUALITY DATA FOR FIVE MONTANA SAMPLING STATIONS,

Geological Survey, Helena, Mont. For primary bibliographic entry see Field 2K. W74-04484

AIR POLLUTION MEASUREMENTS FROM SATELLITES,

General Dynamics, San Diego, Calif. Convair Aerospace Div.

C. B. Ludwig, M. Griggs, W. Malkmus, and E. R. Bartle.

Available from NTIS, Springfield, Va. 22151 NASA CR-2324, Price \$5.50 domestic, \$8.00 foreign; \$1.45 microfiche. National Aeronautics and Space Administration Contractor Report CR-2324, November 1973. 216 p. 81 fig, 18 tab, 201 ref. NASA Contract NASI-10466.

Descriptors: *Remote sensing, *Air pollution, *Satellites(Artificial), Fluorescence, Spectrosco-py, Infrared radiation, Aerosols, *Pollutant

Pollutants can be observed from satellites by either active or passive remote sensing systems. Tropospheric CO, CO2, SO2, NO2, NH3, HCHO, and CH4 can be measured by means of nadir-look-ing passive systems. Additional species such as NO, HNO3, O3, and water may be measured in the stratosphere through a horizon view. A brief theoretical overview of resonance Raman scattering and resonance fluorescence is given. Several techniques for measuring aerosol in a nadir-looking experiment are examined. Radiance measureing experiment are examined. Radiance measure-ments are most promising for general global appli-cations. Stratospheric aerosol may be measured using a sun occulation technique. The instrumenta-tion requirements for both active and passive systems are examined and various instruments under development are described. (Knapp-USGS) W74-04485

LAKES IN THE BOULDER-FORT COLLINS-GREELEY AREA, FRONT RANGE URBAN CORRIDOR, COLORADO, Geological Survey, Washington, D.C.

For primary bibliographic entry see Field 2H.

SCANNING ELECTRON MICROSCOPY OF FIXED, FROZEN, AND DRIED PROTOZOA, Illinois Univ., Urbana. Dept. of Zoology. For primary bibliographic entry see Field 7B. W74-04497

DETERMINATION OF CHROMIUM IN SEA WATER BY ATOMIC ABSORPTION SPEC-

TROMETRY, New England Aquarium, Boston, Mass. Research

T. R. Gilbert, and A. M. Clay. Analytica Chimica Acta, Vol 67, No 2, p 289-295, Dec. 1973. 2 fig, 3 tab, 9 ref.

Descriptors: *Water analysis, *Pollutant identification, *Chromium, *Sea water, Analytical techniques, *Spectroscopy, Oxidation.
Identifiers: Atomic absorption spectrometry, Wet combustion, Sample preparation(For analysis).

A method for determining Cr in sea water with minimum sample preparation involves oxidation of Cr in the filtered sample with potassium peror Cr in the intered sample with potassium per-manganate, followed by extraction with ammoni-um pyrrolidine dithiocarbamate into MIBK (methyl isobutyl ketone), and atomic absorption spectrometry in a fuel-rich air-acetylene flame. Nonfilterable solids are extracted with 12M HCl and analyzed separately. Detection limits of this technique are 0.05 microgram/liter in the liquid and 0.06 microgram/liter in the particulate phase. (Brown-IPC) W74-04516

THE ANALYSIS OF ARSENIC IN THE LIPID PHASE FROM MARINE AND LIMNETIC ALGAE, central Inst. for Industrial Research, Oslo

(Norway).

G. Lunde. Acta Chem Scand. Vol 26, No 7, p 2642-2644, 1972, Illus.

Identifiers: *Arsenic, Chlorella-Ovalis, Chlorella-Pyrenoidosa, *Limetic algae, *Marine algae, Oscillatoria-Rubescens, Phaeodactylon-Tricornutum, Sceletonema-Costatum *Algae(Liqud phase), Neutron activation analysis, *Pollutant identifica-

The arsenic content in the lipid phase extracted from selected marine and limnetic algae was analyzed by use of neutron activation technique. amayzeu by use of neutron activation technique.
The arsenic content varied from about 0.5 ppm to 5
ppm. The algae were cultivated in the laboratory
using enriched cultures. The following types of
algae were investigated: Chlorella ovalis Butcher,
Chlorella pyrenoidosa Chick, Oscillatoria rubescens (DC), Phaeodactylon tricornutum Bohlin,
and Scaletagementer (Cercitation Chronic Cercitation Communication and Sceletonema costatum (Grev.) Cleve.--Copy-right 1973, Biological Abstracts, Inc. W74-04557

OVERGROWTH OF OOZE IRON-MANGANESE MICROORGANISMS STUDIED BY ELECTRON MICROSCOPY, (IN RUSSIAN),

Akademiya Nauk SSSR, Leningrad. Institut Ozerovedeniya.

Ozerovedeniya.
R. S. Kutuzova, D. R. Gabe, and I. M. Kravkina.
Mikrobiologiya. Vol 41, No 6, p 1099-1102. 1972,
Illus, (English summary).
Identifiers: *Electron microscopy, *Iron manganese microorganisms, *Metallogenium, hac-

ganese microorganisms, *Metallogenium, Microorganisms, Ooze, *Siderococcus, Iron bac-

Overgrowth of ooze iron-manganese microorgan-Overgrowth of ooze iron-manganese microorganisms (Metallogenium and Siderococcus) in slotted peloscopes was studied by electron microscopy. A band, covered with a film of collodion or carbon, was inserted between glass bands of the peloscope. Microorganisms, overgrowing the films, were transferred together with the film on copper nets and studied by electron microscopy without can further transferred. without any further treatment. The preparations were made by the replica technique when microorganisms overgrew the glass surface of the peloscopes.—Copyright 1973, Biological Abstracts, Inc. W74-04558

THE EFFECT OF COLLECTING TIME AND GRAIN SIZE ON THE SAMPLING OF STREAM SEDIMENTS FOR GEOCHEMICAL MAPPING IN THE ST. CATHARINES AREA, ONTARIO, Brock Univ., St. Catharines (Ontario). Dept. of Geological Sciences.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Identification Of Pollutants—Group 5A

For primary bibliographic entry see Field 2J.

CHEMICAL QUALITY OF STREAMS, AL-LEGHENY RIVER BASIN AND PART OF THE LAKE ERIE BASIN, NEW YORK, Geological Survey, Albany, N.Y. For primary bibliographic entry see Field 2K. W74-04593

ANALYTICAL TECHNIQUES FOR THE DETERMINATION OF PETROLEUM CONTAMINATION IN MARINE ORGANISMS, Woods Hole Oceanographic Institution, Mass

J. W. Farrington. J. W. Farrington. Available from NTIS, Springfield, Va 22151 as AD-766 792, Price \$3.00 printed copy; \$1.45 microfiche. Technical Report WHOI-73-57, Sep-tember 1973. 24 p. 1 fig. 89 ref. ONR Contract N00014-66-C0241 NSF Grant GA-35646.

Descriptors: *Pollutant identification, *Analytical techniques, *Chromatography, *Gas chromatography, Fluorometry, *Chemical analysis, raphy, Fluorometry, *Chemical analy *Spectrophotometry, Spectroscopy, Infr radiation, Fluorescence, Ultraviolet radiation. Infrared Identifiers: Marine organisms.

The composition of hydrocarbons in petroleum and the composition of hydrocarbons isolated from marine organisms were studied to select the best analytical techniques for the quantification of petroleum contamination in marine organisms. Analytical techniques discussed include column, thin layer, and high pressure liquid chromatog-raphy; I. R., U. V., and U. V.-fluorescence spectrometry; gas chromatography; mass spectrometry; and combinations of methods. Each technique provides information in some of the categories of characteristics for petroleum hydrocarbons. Gas chromatography provides in-formation about the complexity and molecular weight range. It also detects the presence or absence of certain homologous series. In addition, gas chromatography provides the information about native hydrocarbons and their absolute and relative abundance. Careful application of the suggested techniques will provide information about the presence or absence of petroleum contamina-tion in marine organisms and also provide an estimate of the severity of contamination. (Knapp-USGS) W74-04594

AVAILABILITY OF GROUND WATER IN THE WINNSBORO AREA, LOUISIANA, Geological Survey, Baton Rouge, La. For primary bibliographic entry see Field 4B. W74-04596

ANALYSIS OF ORGANIC POLLUTANTS IN WATER AND WASTE WATER, W. Leithe.

w. Leithe. Ann Arbor Science Publishers, Ann Arbor, Michigan. 1973. 213 p. illus., 346 ref. Trans. of Die Analyse der organischer Verunreinigungen in Trink, Brauch-und Abwassern, 1972.

Descriptors: *Water analysis, *Pollutant identification, *Organic compounds, *Water pollution sources, Color, Odor, Sampling, Chromatography, Lipids, Phenols, Detergents, Pesticides, Surfactants, Hydrocarbons, Ureas, Lignins, Humic acids, Analytical techniques. Identifiers: Cyanides, Fatty(Carboxylic) acids, Sterols, Coprosterols, Uric acid, Nitriloacetic acid, Urichromes, Lignosulforis, acid Benzales. acid, Urochromes, Lignosulfonic acids, Benz-

Both general and specific methods of water analysis for organic pollutants are discussed. The following topics are included: Sampling and sample preparation; Quantitative determinations; Subjective tests (for color and odor); Chromatographic

pyrene, Carcinogens.

methods; and Procedures for determining various methods; and Procedures for determining various types of organic compounds. Major kinds of pollutants for which analytical methods are given include: Volatile fatty acids, cyanides, phenols, detergents, surfactants, nitrilocetic acid, hydrocarbons, chlorinated hydrocarbons, pesticides, urea, uric acid, coprosterols, urochromes, humic acids, lignosulfonic acids, and 3,4-benzpyrene. (Brown-IPC) W74-04633

MEASUREMENTS OF THE TURBULENT FLUXES OF MOMENTUM, MOISTURE AND SENSIBLE HEAT OVER THE OCEAN, British Columbia Univ., Vancouver. Inst. of For primary bibliographic entry see Field 2E. W74-04673

THIN-LAYER AND GAS-CHROMATO-GRAPHIC DETERMINATION OF PHENOLS PRESENT IN WATER, (IN GERMAN), Mainz Univ. (West Germany). Hygiene Institut.

H Kunte Zentralbl Bakteriol Parasitenkd Infekionskr Hyg Erste Abt Orig Reihe B Hyg Praev Med. Vol 155, No 1, p 41-49, 1971. Illus. (English summary). Identifiers: *Chromatographic analysis, *Gas chromatography, *Phenols, Water analysis, Pollutant identification, Thin-long chromatography.

A method is described by which organic sub-A method is described by which organic sub-stances are extracted with isopropylether from a 10 I sample of water in a multiple 'cascade dis-tribution process.' The phenolic compounds are separated by extraction with KOH solution and after acidification transferred into ethyl acetate. The ester is concentrated in vacuo and gas chromatographed, the effluent gas stream is directed onto thin-layer plates for further separation and identification. With this method 15 different comnounteration. With this method is different com-pounds can be determined qualitatively and quan-titatively down to 0.2 microgram/liter.—Copyright 1973, Biological Abstracts, Inc. W74-04684

DETERMINATION OF MICROGRAM QUANTI-TIES OF POLYETHYLENE POLYAMINES IN WATER, (IN RUSSIAN), G. S. Salyamon, and N. A. Petrova.

G. S. Salyalmon, and N. A. Fettova. Gig Sanit. Vol 37, No 5, p 59-63. 1972. Identifiers: *Amines, Colorimetry, Quinones, Reagents, Water pollution, *Pollutant identification, *Imines, *Colorimetric analysis, Microgram quan-

The sensitivity of colorimetric analysis of polyamines, based on interaction with eosin and polyamines, pased on interaction with eosin and copper sulfate, increases with a decrease in pH of the medium. By adding citrate buffer solution, pH 2.5-2.7, it reaches 0.006 mg/l for polyethyleneimines (PEI) and 0.02-0.2 mg/l for polyethylene polyamines (PEPA). The Cu-cosin reagent permits analysis of high-molecular PEPA reagent permits analysis of high-molecular PEPA in the presence of low-molecular PEPA. Total high-molecular ethyleneamines and low-molecular amines can be determined colorimetrically using pamines can be determined colorimetricary using printrodiazobenzene. PEPA can be analyzed in the presence of PEI using the known colorimetric reaction for secondary amines with 1,2-aphthoquinone-4-sodium sulfonate. The sensitivity is high (0.02 mg/l).—Copyright 1973, Biological Abstracts, Inc.

RELATIVE EFFICIENCY OF CELL CULTURES

FOR DETECTION OF VIRUSES,
Washington Univ., Seattle. School of Public
Health and Community Medicine.

M. K. Coonev. Health Laboratory Science, Vol 10, No 4, p 294-302, October 1973. 8 tab, 10 ref.

Descriptors: *Viruses, *Cultures, *Pollutant identification, *Isolation.

Identifiers: Adenoviruses, Polioviruses, Cox-sackie viruses, Phinoviruses, Enteroviruses, Echoviruses, *Myxoviruses, *Cytomegaloviruses, Herpesvirus hominis, Feces, Cell cultures.

Viruses collected from nasal and pharvngeal swabs and fecal specimens were used in a comparison of the relative efficiency of HEK cells and WI-38 cells for isolation of viruses. The HEK cells were more efficient for recovery of adenovirus and poliovirus strains, and coxsackievirus (B group) recovery was limited to HEK. Conversely, WI-38 cells were more efficient for recovery of Herpesvirus hominis and the echovirus types en-countered. Recovery of CMV and rhinoviruses was accomplished only in WI-38 cells. Supplemen-tal cell systems were necessary for the recovery of respiratory syncial and, usually, CMV viruses. Mixtures of two viruses in the same specimen were identified much more frequently in HEK cells than in WI-38 cells. (Little-Battelle)

THE DIRECT ENUMERATION OF ESCHERICHIA COLI IN WATER USING MAC-CONKEY'S AGAR AT 44 C IN PLASTIC POLICHES

Centraal Instituut voor Voedingsonderzoek TNO,

Central instituti vol. Vocanigament vol. Zeist (Netherlands).
D. A. A. Mossel, and C. L. Vega.
Health Laboratory Science, Vol 10, No 4, p 303307, October 1973. 2 tab, 36 ref.

Descriptors: *Cultures, *E. coli, *Water analysis, Foods

Identifiers: *Method validation, *Direct enumeration, Feces, Meats, Culture media, Agars, Counting, Sample preparation, Most probable number, Fecal pollution.

Twenty-five water samples were examined by one of the European MPN standard techniques for E. coli (enrichment in brilliant green bile lactose broth and isolation on MacConkey agar at 44 C followed by MacKenzie, et al modification of Eijk-man's elevated temperature test), and by direct enumeration of E. coli in MacConkey agar, using plastic pounches incubated in a water bath at 44 C. Sime forty strains of E. coli freshly isolated from water, stools, fresh meats and poultry were examined by conventional plating in MacConkey's agar at 37 C and in pouches at 44 C. The results obtained in both series of tests substantiated the validity of the suggested direct enumeration procedure, which combines simplicity, reliability and rapidity. (Little-Battelle) W74-04768

SPECTROPHOTOMETRIC ESTIMATION OF ARSENIC IN NITRIC ACID EXTRACTS OF SOIL AND SOIL ADDITIVES, National Vegetable Research Station, Well-

sbourne (England). G F Collier

Journal of the Science of Food and Agriculture, Vol 24, No 9, p 1115-1117, September 1973. 1 tab,

Descriptors: *Spectrophotometry, *Soil analysis, Separation techniques, Nitrites, Soils, Trace ele-ments, Arsenic compounds, Pollutant identification.

Identifiers: *Arsenic, Detection limits, Chemical interference, Recovery, Sample preparation, Ac-

The spectrophotometric determination of arsenic in solutions containing nitric acid necessitates the removal of nitrate ions without loss of arsenic. A convenient and effective method for its removal was achieved by treatment with formic acid. The recoveries of arsenic over the working range, 0.4 to 4.0 ppm gave a standard error of 0.039 and 0.052 ppm, respectively. The recoveries obtained by the proposed method of nitrate removal compare favorably with those of the more tedious evapora-

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5A-Identification Of Pollutants

tion procedures where recoveries of 87 percent are reported. It is also a simple and rapid method and permits the detection of arsenic over the normal working range with the minimum of error. (Mortland-Battelle)

ANALYSIS OF TRACE ELEMENTS, PHOSPHORUS AND SULPHUR, IN THE LIPID AND THE NON-LIPID PHASE OF HALIBUT (HIPPOGLOSSUS HIPPOGLOSSUS) AND TUNNY (THUNNUS THYNNUS),
Central Inst. for Industrial Research, Oslo

(Norway).

Journal of the Science of Food and Agriculture, Vol 24, No 9, p 1029-1038, September 1973. 2 fig, 4 tab. 14 ref.

Descriptors: *Phosphorus, *Sulfur, Fish, *Lipids, Cadmium, Lead, Copper, Zinc, Iron, Mercury, Separation techniques, Neutron activation analysis, X-ray fluorescence, Bromine, *Trace ele-ments, Food chains.

Identifiers: Selenium, Arsenic, *Halibut, *Tunny, Sample preparation, Atomic absorption spec-

To study the effect which some natural conditions have upon the level of trace elements, halibut was chosen as representative for a relatively stationary species of fish and old individuals of tunny were selected as examples of non-stationary fish. Samples were homogenized in a blender and extracted with hexane. The insoluble phase (meal) and the aqueous phase were dried, weighed, ashed, the ash dissolved in HCl, and diluted with water. The determination of zinc, iron, selenium, copper, lead, and cadmium in the meal and in the dehydrated aqueous phase was carried out using atomic absorption spectrophotometery and X-ray fluorescence techniques for zinc, cadmium, lead, copper, arsenic, and iron and neutron activation for the analysis of selenium. Mercury was determined together with the selenium in the meal by non-destructive activation analysis. In the aqueous phase the mercury was analyzed in some samples by flameless atomic absorption spec-trophotometry. The results show that the tunny which cover a great area and occupy positions near the top of the marine food chain show large variations in the content of the different trace ele-ments analyzed. The halibut samples taken from the various localities did not show such a great dif-ference in the content of trace elements analyzed for. Nor could any particular difference between young and old individuals be observed. The conyoung and old individuals be observed. The con-tent of the heavy metals lead, copper, zinc and cadmium seems on average to be within the same range as formerly reported. The values for iron found in halibut, are, however, remarkable low. (Morland-Battelle)

A BACTERIOLOGICAL PRESSURE-RETAINING DEEP-SEA SAMPLER AND CULTURE

Woods Hole Oceanographic Institution, Mass. H. W. Jannasch, C. O. Wirsen, and C. L. Winget. Deep-Sea Research, Vol 20, No 7, p 661-664, July 1973. 2 fig. 7 ref.

Descriptors: *Marine bacteria, *Sampling, Cultures, Pressure, Incubation, Mixing, Instrumentation, Deep water, Design criteria, Oceans, Mechanical equipment.
Identifiers: *Culturing vessels, *Deep sea sampler.

In order to overcome the decompression problem in bacteriological deep-sea sampling, an instru-ment was constructed that can be operated both as ment was constructed that can be operated both as a sampler and pressurized culture vessel. The 1-liter sample does not undergo a change of pressure during filling at the site of sampling nor during retrieval to the surface and prolonged periods of incubation in the laboratory. Sub-samples of 13 ml may be withdrawn and added without affecting the pressure within the vessel. Means for easy pressure adjustment as well as internal mixing are pro-vided. The sampler was built for operation at pressures of up to 200 atm with a 2 1/2-fold safety margin. It has been successfully tested under internal and external maximum pressure and was used for laboratory experiments. Another instrument to be used for sampling at depths of up to 6000 m is under construction. The sampler consists of two stacked cylinders, each containing a floating piston. It includes three chambers, one of which is divided in two sections by a fixed block containing the adjustable orifice and port for prefilling with sterile distilled water. The sample chamber is lined with non-porous Teflon. The upper end-cap contains the sample inlet valve, the bottom end-cap and a valve for charging the third chamber with air. Six tie-rods clamp the components into a pres-sure-tight assembly. (Mortland-Battelle) W74-04773

NUCLEONIC SEDIMENT CONCENTRATION GAUGE - COMPARISON OF TRANSMISSION AND SCATTERING MODES,

Bhabha Atomic Research Centre, Bombay (India), Isotope Div.

For primary bibliographic entry see Field 2J. W74-04774

APPARATUS FOR RECORDING AVOIDANCE OVEMENTS OF FISH,

Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.

Journal of the Fisheries Research Board of Canada, Vol 30, No 10, p 1594-1596, October 1973. 3 fig. 3 ref.

Descriptors: *Toxicity, *Bioassay, *Laboratory equipment, *Fish behavior, Movement, Design criteria, Costs, Instrumentation, Water pollution effects, Electronic equipment, Pollutants. Identifiers: Recorders.

An apparatus for continuously recording movements of fish exposed to chemical substances in a tank consists of an open sight viewer connected to the shaft of a power-supplied potentiometer and mounted so that an observer can track a specimen in the test chamber. The tank is designed with in-lets at each end and an outlet in the middle so that a test solution can be precisely added to one end and untreated water at the other end of the tank. The tank is observed through a one-way mirror to reduce visual disturbance of the fish. Varying the position of the viewer changes the output voltage from the potentiometer to a strip chart recorder. The viewer also actuates a voltage sensitive switch which activates a timer when the fish enters one half of the tank and gives a cumulative time of exposure to the conditions in that section. A second timer records overall elapsed test time. Sample recordings show the avoidance response of gold-fish when exposed to HgCl2. Total cost of materials to build the system is 1350 dollars, and con-struction time is about 50 manhours. (Little-Bat-W74-04776

USE OF A SILVER-SULFIDE ELECTRODE FOR STANDARDIZING AQUEOUS SULFIDE SOLU-TION IN DETERMINING SULFIDE IN WATER, Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst. J. Barica.

Journal of the Fisheries Research Board of Canada, Vol 30, No 10, p 1589-1591, October 1973.

Descriptors: *Sulfides, *Aqueous solutions, *Water analysis, *Pollutant identification, Methodology, Volumetric analysis, Pollutants, Chemical analysis.

Identifiers: *Silver/sulfide electrodes, Standardization, Potentiometric titration, Endpoints, Iodometric standardization, Ion selective elec-

A simplified method is described for standardizing aqueous sulfide solution in determining sulfide in water. A silver-sulfide electrode is used to detect the endpoint in titration of standard solution of sodium sulfide by silver nitrate. The method makes it possible to perform potentiometric titramakes it possible to perform potentioneris turns tition within 60 sec by adding the titrant until the potential reading is between -150 and 0 my, without plotting the data on a graph. The concen-trations of sulfide solutions determined by this method were within plus or minus 0.24 mg S (SD), or 3 percent, of the values obtained by the conventional iodometric standardization. (Holoman-Battelle) W74-04777

MERCURY UPTAKE AND ION DISTRIBUTION IN GILLS OF RAINBOW TROUT (SALMO GAIRDNERI): TISSUE SCANS WITH AN ELEC-TRON MICROPROBE,

Michigan State Univ., East Lansing. Dept. of Physiology.

Journal of the Fisheries Research Board of Canada, Vol 30, No 10, p 1575-1577, October 1973. 4 fig. 7 ref.

Descriptors: "Rainbow trout, "Mercury, "Distribution patterns, Bioassay, Path of pollutants, Heavy metals, Ions, Absorption, Electron microscopy, Freeze drying.

Identifiers: "Gills, "Methylmercury,

*Bioaccumulation, Sample preparation, Biological samples, Transport.

Rainbow trout were exposed to 0.25 ppm HgCl2 and 0.05 ppm methylmercury for 23 hr and the gills removed and examined by electron microprobe for the purpose of identifying the pathway of Hg up-take. Gills were prepared by quick freezing, cutting into 4-10-micron sections, mounting on quartz slides or carbon discs, and freeze drying. Mercury was found in gills of rainbow trout which had been exposed to inorganic mercury but not in those exposed to methylmercury. No specific site for mercury uptake was identified and it is suggested that inorganic mercury enters the gill across the general lamellar surface. High concentrations ere found associated with the gill cartilage. Since little ion diffusion occurs during tissue prepara-tion, localization and /or identification of tissues can be accomplished by scans for various elements: sodium (Na), potassium (K), Chlorine (Cl), and sulfur (S). The technique is not suitable for identification of highly volatile compounds such as methylmercury due to the necessity of subjecting tissues to high vacuum conditions, however, electron probe analyses should be useful in studies of active ion transport systems in gill tissue and in investigations of the effects of heavy metal pollutants on fishes. (Little-Battelle) W74-04778

BIOASSAY PROCEDURES TO EVALUATE ACUTE TOXICITY OF NEUTRALIZED BLEACHED KRAFT PULP MILL EFFLUENT TO PACIFIC SALMON,

Fisheries Research Board of Canada, West Van-couver (British Columbia). Pacific Environment

For primary bibliographic entry see Field 5C. W74-04779

EFFECTS OF CADMIUM AND COPPER ON THE OXIDATION OF LACTATE BY RAINBOW TROUT (SALMO GAIRDNERT) GILLS, Fisheries Research Board of Canada, West Van-couver (British Columbia). Vancouver Lab. For primary bibliographic entry see Field 5C. For primary W74-04780

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Sources Of Pollution—Group 5B

MEASUREMENT OF ADENOSINE TRIPHOSPHATE (ATP) IN TWO PRECAMBRI-AN SHIELD LAKES OF NORTHWESTERN ON-

TARIO,
Fisheries Research Board of Canada, Winnipeg

(Manitoba). Freshwater Inst. For primary bibliographic entry see Field 5B.

DIURNAL VARIATION OF DISSOLVED INOR-GANIC CARBON AND ITS USE IN ESTIMAT-ING PRIMARY PRODUCTION AND CO2 INVA-

ING PRIMARY PRODUCTION AND COZ INVA-SION IN LAKE 227, Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst. D. W. Schindler, and E. J. Fee.

Journal of the Fisheries Research Board of Canada, Vol 30, No 10, 1501-1509, October 1973. 10 fig. 9 ref.

Descriptors: *Photosynthesis, Limiting factors, *Carbon, *Primary productivity, Diurnal, *Gas chromatography, Standing crops, *Bioassay, Lakes, Growth rates, Phosphates, Nitrates, Biomass, Phytoplankton, Absorption, Eutrophication, Methodology, Radioactivity techniques, Carbon dioxide, Atmosphere, Nutrients, *Canada. Identifiers: Errors, Dissolved inorganic carbon.

In the course of studying phytoplankton response to low carbon levels and fertilization with phosphate and nitrate in lake 227 a eutrophic softpnospnate and nitrate in lake 22/ a eutrophic soft-water lake in the Canadian Shield, several paradoxes were observed. Although standing crop increased after fertilization, primary productivity as measured by C-14 uptake at midday remained the same as for unfertilized lakes. Furthermore, although, carbon, was shown, not, to limit although carbon was shown not to limit phytoplankton standing crop, certain observations pointed to carbon limitation of photosynthesis. To attempt to resolve these inconsistencies, a new method was employed based on the diurnal variation of dissolved inorganic carbon (DIC), community respiration, and invasion of CO2 as measured by gas chromatography. Errors were found to result from diurnal variations in the degree of car-bon limitation of phytoplankton and from invasion of CO2 from the atmosphere and hypolimnion. Production by phytoplankton in lakes fertilized with nitrogen and phosphorus was found to be several times higher than in natural lakes of the area. Net production during summer stratification was found to equal invasion of CO2 from the at-mosphere. The new technique should have application in other eutrophic low carbon lakes, where C-14 tracer techniques are encumbered by serious technical complications. (Little-Battelle) W74-04784

PRODUCTION OF EPILITHIPHYTON IN TWO LAKES OF THE EXPERIMENTAL LAKES AREA, NORTHWESTERN ONTARIO,

Fisheries Research Board of Canada, Winnipeg

(Manitoba). Freshwater Inst. For primary bibliographic entry see Field 5C. W74-04787

A SYRINGE GAS-STRIPPING PROCEDURE FOR GAS-CHROMATOGRAPHIC DETER-MINATION OF DISSOLVED INORGANIC AND ORGANIC CARBON IN FRESH WATER AND CARBONATES IN SEDIMENTS, Fisheries Research Board of Canada, Vol 30, No 10, p 1441-1445, October 1973. 2 fig, 1 tab, 9 ref.

Descriptors: *Gas chromatography, Freshwater, *Sediments, *Water analysis, Soil analysis, Carbon, Carbamates, Methodology, Chemical analysis, Aquatic soils, Calcite, Dolomite, Nutrients, Nitrilotriacetic acid, Ureas, Calcium carbonate, Canada.

*Dissolved inorganic carbon,

*Dissolved organic carbon, Syringe gas-stripping
method, Sample preparation, Sensitivity, Chemical recovery, Precision, Organic carbon, Lake Winnipeg, Oxalic acid, Tartaric acid, Dextran, Sucrose, Glucose.

A simple, rapid method is described for determining dissolved inorganic carbon in water. A 20-cu cm sample of water is drawn into a 50-cu cm cm sample of water is travel into a 3-cc or polypropylene syringe and acidified by injection of 1-cu cm of dilute sulphuric acid. Twenty-nine cubic centimeters of helium at atmospheric pressure is injected into the syringe followed by 10 sec sure is injected into the syringe followed by 10 sec of manual agitation to partition CO2 between gas and liquid phase. The gas phase containing 60 per-cent of CO2 from the sample is then analyzed by gas chromatography. This method has been used to determine dissolved inorganic and organic car-bon in Canadian Shield waters and to determine total carbonates in sediments. (Holoman-Battelle) W74-04788

IDENTIFICATION OF BACTERIA BY COM-

PUTER: THEORY AND PROGRAMMING,
Central Public Health Lab., London (England).
National Collection of Type Cultures.

W. R. Willcox, S. P. Lapage, S. Bascomb, and M. A Curtie

Journal of General Microbiology, Vol 77, No 2, p 317-330, August 1973. 1 tab, 28 ref.

Descriptors: *Aerobic bacteria, *Computer pro grams, *Pollutant identification, Statistical methods, Probability, Laboratory tests, Numeri-cal analysis, Enteric bacteria, Pathogenic bacteria, Methodology. Identifiers: Bayesian probability.

The methods incorporated in the computer program used in a trial of computer-aided identification of bacteria are described. The identification method is based on Bayes's theorem and allows for dependent tests and missing data in the proba-bility matrix. It was found useful in developing the method to take account of the occurence of errors in bacteriological testing. The method suggests a definite identification only if the Bayesian probability of one of the taxa exceeds a threshold level; if not, a separate procedure selects the best tests to continue the identification. (Mortland-Battelle) W74-04791

PROBLEM OF ISOLATING SALMONELLA FROM SURFACE WATERS EXEMPLIFIED BY LONG-TERM STUDIES IN THE BERLIN AREA, CAPITAL OF THE GERMAN DEMOCRATIC REPUBLIC, (IN GERMAN),

W. Krueger. Z Gesamte Hyg Grenzgeb. 18(8): p 590-593. 1972. Identifiers: *Germany(Berlin area), Human diseases, *Salmonella isolation, Sever discharges, Surface waters, *Public health.

Reliable bacteriological diagnosis is a condition of true epidemiological interpretation of instances of Salmonella isolation from surface waters. Surface water samples (184) taken from various biotopes in the area of Berlin yielded 98 strains of Salmonella of 18 serotypes. The isolation of 10 rare types in a water clearing installation and previous tests in-dicated that the Salmonella spectrum of surface waters with sewer discharges is an exact reflection waters with sever discharges is an exact reflection of the epidemiological situation among the population and in animal products. Surface waters without discharges from sewers were Salmonella free.—Copyright 1973, Biological Abstracts, Inc. W74-04835

5B. Sources Of Pollution

BASELINE QUALITY DATA FOR KALIHI

STREAM, Hawaii Univ., Honolulu. Water Resources Research Center.

Research Center.

G. K. Matsushita, and R. H. F. Young.

Available from National Technical Information

Service as PB-227 929 \$6.50 in paper copy, \$1.45 in

microfiche. Technical Report No 71, June 1973. 61 p, 40 fig, 11 tab, 35 ref. OWRR A-027-HI(2). 14-31-0001-3811.

Descriptors: *Water quality, Water samples, Density, Drainage, Sampling, Weather, Pesticides, *Hawaii, *Baseline studies, *Land use, *Water quality standards, *Path of pollutants, Coliforms, Domestic wastes, Nutrients.
Identifiers: *Kalihi stream(H.I.).

The purpose was to determine the changes in Ralihi Stream water quality related to variations in land use patterns and to establish some baseline data for assessing the Hawaii State Water Quality Standards for surface waters. Effects on water quality were determined by collecting and analyzing water samples from four sites located along the course of Kalihi Stream between October 1971 to August 1972. The sites were selected within different land use areas along the stream to account for any variation in contribution from un-developed and developed lands. The stream water quality data for wet and dry weather flows were found to compare favorably with that of other Hawaiian investigators and were in the same order of magnitude as those in the U.S. and other countries. Pollution loads were also calculated on a lbs/acre/day basis and these results compared favorably with results obtained by other U.S. and Hawaiian investigators. The parameter concentrations and pollutional loads were found to increase in a downstream direction as incremental and individual subbasin drainage areas increased in development, land use activity, population density and housing density. Fecal and total coliform den-sities exceeded Class 2 Standards during dry and wet weather conditions. The nutrient standards for Class A waters were also exceeded during dry and wet weather. There was no significant pesticide results were in the low ppt range.

W34-04309

MIXING PROCESSES,

R. L. Wiegel.

In: Oceanographical Engineering, Chapter 16, p 424-441, 1964. 20 fig, 44 ref. Prentise Hall, New York, NY, Price: \$24.75.

Descriptors: Coasts, *Sewage disposal, *Mixing, *Outfall sewers, *Waves(Water), *Outfall sewers,
*Currents(Water), *Effluents. Identifiers: Ocean outfall sewers, Eddy diffusion, Breaking waves, Turbulent flow, Turbulent jets,

Mixing processes are of prime importance to the engineer and to the oceanographer. The transfer of heat down through the surface layers of the ocean is largely due to mixing by eddy diffusion and by large-scale stirring induced by the breaking of waves in a sea. The entrainment of water by currents is due to the mixing of the currents with the boundary waters. The disposal of sewage by coastal towns is usually done by the mixing of the effluent from ocean outfall sewers with the sea water. Some of these mixing processes are described. Explanations are given on the following: mixing of turbulent jets, jet discharging into denser fluid, jet discharging horizontally into denser fluid, jet discharging horizontally into denser fluid, jet discharging into fluid with a stable density gradient, horizontal jet as a free surface, eddy diffusion, mixing by wind waves, and mixing by currents. (Sinha-OEIS) W74-04327

A STUDY OF DIFFUSION IN AN ESTUARY, Navy Hydrographic Office, Washington, D.C.

W. E. Maloney, and C. H. Cline.

w. E. Madoney, and C. H. Chie. In: Proceedings of Seventh Conference on Coastal Engineering, The Hague, Netherlands, August 1960, ASCE, Published by Council, the Engineer-ing Foundation, Vol 2, Chap 29, 536-547, 1961.

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5B-Sources Of Pollution

Descriptors: *Estuaries, *Pollutants, *Diffusion, Dispersion, Tidal effects, River flow, Coasts, *Virginia.

Identifiers: Hampton Roads(VA), Flushing, James River(VA), Dilution.

A diffusion-advection method based on a coefficient of eddy diffusivity is used to determine the reduction in concentration and removal of contaminants from estuaries. The discussions are con-cerned with that portion of a contaminant that goes into solution and partakes of the motion of the waters. A set of empirical dilution factors was computed. The total amount of contaminant released multiplied by the appropriate dilution factor gives the concentration at that time. Two dilution factors are given so that computations may be made either in terms of cubic centimeters or cubic feet. The rapid leveling off of the dilution factors after about 1 tidal cycle assumes that none of the contaminant is advected out of the area. (Sinha-W74-04333

CURRENTS AT HARBOR BEACH, MICHIGAN, United States Lake Survey, Detroit, Mich.

J. H. Saylor. Available from NTIS as AD-676 838, for \$6.00 paper copy, \$1.45 microfiche. Research Report No. 1-3, August 1968. 27 p, 11 fig, 7 ref.

Descriptors: Lakes, *Lake Huron, *Harbors, *Currents(Water), *Water circulation, Winds, *Wind tides, *Thermal pollution, Industrial wastes, Waste disposal, Water pollution, Heated water, Power plants, *Michigan, Path of pollutents. tants.

Identifiers: Flushing, Nearshore, Wind driven currents, Hindcasting.

Currents at Harbor Beach, Michigan were measured using drogue and dye techniques. The measurements showed two patterns of harbor currents depending on the direction of current flow along the shore of Lake Huron. Strong, northerly wind caused southward-flowing currents along the shore of the lake, southward currents along the shore side of the harbor, and good harbor flushing. Wind from directions other than northerly was associated with northward-flowing currents along the shore of the lake and sluggish, northward currents through the harbor. The pattern of northward harbor currents occurred about 75% of the time. It was concluded that the prevailing nearshore currents at this location on Lake Huron are northward. The current patterns show that a power plant recently constructed north of the U.S. Coast Guard Boathouse can expect to recirculate a portion of its own discharge and a portion of the effluent from the Hercules Powder Company (located on the north side on the Company's dock) for the same percentage of time. Turbulence of the power plant discharge will accelerate the vertical mixing of this effluent to all depths. Currents in the vicinity of the new intake and discharge channel will alter patterns locally, but it is not felt that they will change the overall harbor circulation which is driven principally by the nearshore cur-rents in Lake Huron. (Sinha-OEIS) W74-04342

ENVIRONMENTAL MONITORING AND DISPOSAL OF RADIOACTIVE WASTES FROM U.S. NAVAL NUCLEAR-POWERED SHIPS AND THEIR SUPPORT FACILITIES, 1972 Department of the Navy, Washington, D.C. M. E. Miles, and G. L. Sjoblom. Available from the Supt. of Documents, U.S.

Government Printing Office, Washington, D.C. \$1.00 per copy. Radiation Data and Reports, 14, No 9, p 517-525, Sept. 1973. 5 tab, 24 ref.

Descriptors: "Nuclear reactors, "Ships, "Radioactive waste disposal, "Harbors, Oceans, Seas, Water pollution, Water pollution sources, Monitoring, Measurement, Assay, Sampling, Tox-

icity, Public health, Tritium, Cobalt, *United

The environmental effect of disposal of radioactive wastes originating from U.S. Naval nuclear propulsion plants and their support facilities is as sessed. The total radioactivity discharged to all ports and harbors from the more than 100 nuclearports and harbors from the more than 100 nuclear powered ships and supporting tenders, bases and shipyards was less than 0.002 curie in 1972. Procedures used by the Navy to control releases of radioactivity from U.S. Naval nuclear-powered ships and their support facilities are effective in protecting the environment and the health and safety of the general public. (Houser-ORNL) W74-04441

A HISTORY AND PRELIMINARY INVENTORY REPORT ON THE KENTUCKY RADIOACTIVE WASTE DISPOSAL SITE, Kentucky Dept. of Health, Frankfort. Radiological Health Program.

D. T. Clark Available from Supt. of Doc., U.S. Print. Off., Washington, D.C., \$1.00 per copy. Radiation Data and Reports, Vol 14, No 10, p 573-585, Oct. 1973. 6 fig, 2 tab, 9 append.

Descriptors: *Waste disposal. *Radioactive waste disposal, "Solid wastes, "Liquids, "Kentucky, Nuclear wastes, Assay, Radioisotopes, History, Census, Strontium, Cesium, Tritium, Cobalt, Radium radioisotopes, Permits, Regulation, Data collections, Water pollution, Soil contamination, Public health, Waste storage. Identifiers: *Waste burial.

The Kentucky radioactive waste disposal site, operated by the Nuclear Engineering Company, Inc., has been in operation since March 1963. As of January 1, 1972, approximately 0.71 million cubic meters of waste, containing 1,153,333 curies of byproduct material, 208,903 grams of special nuclear material, and 39,493 kilograms of so material, have been disposed of at this facility. Due to the relatively long period of operation and the large quantities of radioactive material involved, a detailed inventory of two of the largest pits at the site was made, based on available disposal records. A brief history of this facility and a summary of the inventory results are presented. Detailed data are given for plutonium, cesium, strontium, cobalt, radium, and tritium. (Houser-W74-04442

ECODISTRIBUTION OF PLUTONIUM IN LIQUID WASTE DISPOSAL AREAS AT LOS

Los Alamos Scientific Lab., N. Mex T. E. Hakonson, L. J. Johnson, and W. H. Purtymun.

Available from NTIS, Springfield, Va., as Report No. LA-UR-73-1001. \$4.00 per copy, \$1.45 microfiche. Report No. LA-UR-73-1001, 1973. 23 p, 3 fig, 3 tab, 9 ref.

Descriptors: *Waste disposal, *Liquid, Plutonium, Mexico, *Ecology, *New *Ecosystems, *Ecological distribution, Geology, Canyons, Surveys, Assay, Radioactivity, Sedi-ments, Water, Biota.

The nuclear programs at Los Alamos have generated quantities of solid and liquid radioactive wastes. Although the liquid wastes are treated to remove impurities, a small but measurable fraction of the radioactive constituents remain in the effluent. Currently, these effluents are released into two canyons where they eventually disappear into the alluvium. In the past, an additional canyon was used as a liquid waste disposal area, but has not been used since 1964. A survey was initiated in each of these canyons to determine the concentrations of effluent-associated radionuclides in the al-luvial sediments, water and some of the native

biota. Preliminary findings are summarized on the ecodistribution of Pu-238 and Pu-239 in Mortandad Canyon, an area which has been used for liquid effluent disposal. (Houser-ORNL) W74-04443

ONE-DIMENSIONAL MODEL OF THE MOVE-MENT OF TRACE RADIOACTIVE SOLUTE THROUGH SOIL COLUMNS: THE PERCOL MODEL, Battelle-Pacific Northwest Labs., Richland,

wasn. R. C. Routson, and R. J. Serne. Available from NTIS, Springfield, Va., as Report No. BNWL-1718. \$5.45 per copy, \$1.45 microfiche. Report No. BNWL-1718, 1972. 60 p, 25 fig, 16 tab, 7 ref.

Descriptors: Model studies, *Radioactivity, *Soil chemical properties, *Soil contamination, Soil physical properties, Soil properties, Soil water movement, *Mathematical models, *Path of pollu-

Identifiers: *Radionuclide movement(Soils)

one-dimensional mathematical model. PER-COL, has been developed to predict the move-ment of radionuclides through porous media as a function of measureable chemical parameters of the media. Laboratory column studies were conducted to verify the model. System parameters considered include soil type, radionuclide type, waste composition, flow rate, column length, and soil saturation. The agreement between measured radionuclide movement and that predicted by the model is considered good. (Houser-ORNL) W74-04444

AERIAL RADIOLOGICAL MEASURING SUR-VEY OF THE AREA SURROUNDING THE ROBERT EMMETT GINNA NUCLEAR POWER PLANT, ONTARIO, NEW YORK, SEPT. 8, 1970. EG and G, Inc., Las Vegas, Nev. For primary bibliographic entry see Field 5A. W74_04446

AERIAL RADIOLOGICAL MEASURING SUR-VEY OF THE AREA SURROUNDING THE LA CROSSE BOILING WATER REACTOR, GENOA, WISCONSIN, JULY 1968. EG and G, Inc., Las Vegas, Nev. For primary bibliographic entry see Field 5A. W74-04447

AERIAL RADIOLOGICAL MEASURING SUR-VEY OF THE AREA SURROUNDING THE VER-MONT YANKEE GENERATING STATION AND THE YANKEE NUCLEAR POWER STATION, SEPTEMBER 18, 1970. EG and G, Inc., Las Vegas, Nev. For primary bibliographic entry see Field 5A. W74-04448

AERIAL RADIOLOGICAL MEASURING SUR-VEY OF THE AREA SURROUNDING THE POINT BEACH NUCLEAR PLANT, TWO CREEKS, WISCONSIN, AUGUST 16 AND 17,

EG and G, Inc., Las Vegas, Nev. For primary bibliographic entry see Field 5A. W74-04449

ANNUAL CONSUMPTION OF CESIUM-137 AND COBALT-60 LABELED PINE SEEDS BY SMALL MAMMALS IN AN OAK-HICKORY

FOREST, Oak Ridge National Lab., Tenn. J. B. Mathies, P. B. Dunaway, G. Schneider, and S. I. Auerbach.

Available from NTIS, Springfield, Va., as Rept. No. ORNL-TM-3912. \$7.60 per copy, \$1.45 microfiche. Report No. ORNL-TM-3912, Dec.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Sources Of Pollution—Group 5B

1972. 234 p, 33 fig, 62 tab, 166 ref, 3 append. (Ph.D. Thesis, Michigan State University, Lansing).

Descriptors: Mammals, *Rodents, *Absorption, Radioactivity, *Cesium, *Cobalt, *Radioisotopes, Diets, Digestion, Toxicity, Assay, *Forests, Trees, Hickory trees, Oak trees, Seeds, Soils, Vegetation, Seasonal, Ecology, Research and Development, *Tennessee.

Annual and seasonal consumption of eastern white Annual and seasonal consumption of eastern white pine seeds was determined radioisotopically in both laboratory and free-ranging populations of small forest mammals within a 2-ha, oak-hickory forest in eastern Tennessee. White-footed mice were chronically-fed Cs-137 and Co-60 labeled pine seeds in the laboratory, and the resultant uptake, equilibrium, and excretion patterns in mice were used to infer food consumption rates. Seedmeet to fine 1 too do consumption rates. Seek ingestion rates, of from 2 to 100 seeds per day, were highly correlated with equilibrium levels of Cs-137. Lowering the ambient temperature resulted in lower equilibria, through a range of 21.1C to 4.4C; equilibria in male mice was lower than in females. Free-ranging mice rapidly acquired radioactive body burdens of both isotopes. (Houser-ORNL)

ENVIRONMENTAL SURVEILLANCE FOR FUEL FABRICATION PLANTS, Battelle Pacific Northwest Labs., Richland, Wash. J. P. Corley, D. A. Waite, J. W. Johnston, and L.

C. Schwendiman.

Available from NTIS, Springfield, Va., as Rept.
No. BNWL-1723. \$5.45 per copy, \$1.45
microfiche. Report No. BNWL-1723, April 1973.
71 p, 1 fig, 2 tab, 70 ref, 4 append.

Descriptors: Surveys. *Monitoring. Descriptors: Surveys, "Monitoring, *Radioactivity, Assay, Air pollution, Water pollu-tion, Soil contamination, *Nuclear powerplants, Nuclear wastes, Fuels, Environment, Sampling, Standards, Regulation, Path of pollutants, Sediments, Vegetation, Biota, Aquatic animals, Fish, Public health.

Identifiers: *Fuel reprocessing, *Surveillance pro-

Source material is provided which may be used for: (a) preparation of a regulatory guide concerning environmental surveillance programs for fuel fabrication facilities; (b) evaluation of those por-tions of environmental statements for fuel fabrication facilities pertaining to proposed environmen-tal surveillance programs. Included is an environ-mental surveillance program sufficiently general mental surveinance program surfricently general to cover plants fabricating uranium oxide or mixed uranium and plutonium fuels. Program content is not specific to a particular plant. The proposed program provides for surveillance of media believed either to be significant in terms of dose to man or to be potential centers for long-term accuman or to be potential centers for long-term accumulation of contaminants. To avoid excessive duplication which would result from complete treatments of uranium and mixed oxide plants separately, discussion of the proposed program is presented mainly in terms of plutonium. The program is, however, equally applicable to both uranium and mixed oxide plants, with recognized points of divergence projected out and discussed (Houserof divergence pointed out and discussed. (Houser-ORNL)

RADIOLOGICAL STATUS OF THE GROUND-WATER BENEATH THE HANFORD PROJECT,

JULY-DECEMBER 1972, Battelle Pacific Northwest Labs., Richland, Wash. K. L. Kipp, Jr.

Available from NTIS, Springfield, Va., as Rept. No. BNWL-1752. \$4.00 per copy, \$1.45 microfiche. Report No. BNWL-1752, Aug. 1973. 34p, 3 fig, 9 tab, 4 ref.

Descriptors: *Surveys, Radioactivity, Ground-water, *Radioisotopes, *Tritium, *Nitrates, Mea-

surement, Assay, Regulation, Cobalt radioisotopes, Columbia River, Path of pollutants, Public health, *Washington. Identifiers: *Ruthenium, Hanford site, Gross beta. Regulation.

An evaluation of 106-Ru and 3-H concentrations measured near the surface of the unconfined groundwater during the last half of 1972 showed that zones of detectable contamination extended in an easterly to south-easterly direction, as has been observed in the past. Measurable tritium and nitrate ion concentrations were found along the Columbia River. A low groundwater mound showing uranium and nitrate ion continued to be obing uranium and nutrate ion continued to be ob-served in some areas. The few locations were identified for which average groundwater concen-trations exceeded the Concentration Guide (CG) of 10 pC/Iml for 106-Ru. Significant concentra-tions of 106-Ru (over 10% of CG) were found in some areas. Gross beta activity in the groundwater beneath some areas was detectable. (Houser-W74-04452

STRONTIUM-90 AND CESIUM-137 LEVELS IN STRONTIUM-90 AND CESTUM-137 LEVELS IN SOILS OF VARIOUS TYPES AT NIIGATA PREFECTURE, JAPAN, Niigata Univ. (Japan). Faculty of Agriculture. K. Kawase, and E. Yokoyama. Journal of Radiation Research, Vol 14, No 1, p 40-48, March 1973. 2 tab, 17 ref.

Descriptors: *Nuclear explosions. *Radioactivity. *Fallout, *Soil contamination, *Strontium, *Cesium, Measurement, Uptake, Vegetation, Grassland, Forests, Lagoons, Rice, Aquatic soils, Monitoring, Soil leaching, Ion transport, Movement, Depth.

Identifiers: *Japan.

Sr-90 and Cs-137 contents of soils, mostly from radioactive fallouts of past nuclear explosions, were estimated at 15 locations in Niigata Prefecture. Fifteen locations include paddy fields, meadow, grass fields, forest and dried lagoon. Sr 90 contents of the soils, except forest and dried lagoon, ranged from 81 to 315 mCi/km sq. and Cs-137 ranged from 234 to 451 mCi/km sq. These results indicate that the soils except forest and lagoon were highly contaminated with Sr-90 and Cs-137 from radioactive fallouts. The high activities of Sr-90 and Cs-137 were noted in rice paddy fields. Sr-90 of 316 mCi/km sq of Muramatsu Town and Cs-137 of 451 mCi/km sq of Gosen City are probably the highest values recorded in Japan. These high values may reflect the high annual rainfall of these areas. Relatively low Sr-90 and Cs-137 levels of forest soils and dried lagoon suggest that Sr-90 in strongly acidic, sandy and low humic soils were washed away rather easily by water and that Cs-137 in very reductive paddy soil and in volcanic and the soil was the soil was a soil a manual by water. The ash soil were also easily removed by water. The distribution of Sr-90 and Cs-137 in relation to various depth of soils indicates that the monitoring of two nuclides in soils should be carried out from the soil sample dug to 50 cm depth. (Houser-ORNL) W74-04453

TRANS-PACIFIC FALLOUT AND PROTECTIVE COUNTERMEASURES, Oak Ridge National Lab., Oak Ridge, Tenn.

C. H. Kearny.

C. ri. Nearny.

Available from NTIS, Springfield, Va., as Report
No. ORNL-4900, \$4.00 per copy, \$1.45 microfiche.

Report No. ORNL-4900, Nov. 1973. 25 p, 4 fig, 1
tab, 19 ref.

Descriptors: *Fallout, *Radioactivity, *Meteorology, Movement, *Nuclear explosions, United States, Hazards, Warning systems, Iodine, *Radioactivity, Milk, Public health, Safety, Air circulation, *Air pollution.
Identifiers: *China.

If a nuclear war in which the United States is not a belligerent is fought in China and if the weapons used produce tropospheric fallout, then the trans-Pacific fallout deposited on the United States may create long-term health hazards that protectiv counter-measures can do much to lessen Extrapolations are made from the measured results of lower tropospheric fallout deposited in the United States from four of the first five Chinese tests. It is estimated that if during a war 65 megatons of similar weapons were detonated on or megators of similar weapons were decinated on over China so as to produce similar lower tropospheric debris, then in extensive areas of the 50 states much milk would be dangerously contaminated with radioactive iodine. Hazards and expected long-term casualties from eating other fallout-contaminated foods and from exposure to total whole-body gamma doses of 1 to 10 rems from such trans-Pacific fallout in the year following a spasm war are summarized. Also outlined are recommended protective counter-measures and the psychological-political advantages likely to be attained if the President and other high officials were prepared to give all Americans an early, factual account of the approaching trans-Pacific fal-lout dangers and of the protective countermea-sures being taken to minimize casualties and economic losses. (Houser-ORNL)

RADIOLOGICAL ENVIRONMENTAL SUR-VEY AT EBR-II, B. G. Oltman, K. Eckerman, R. Gold, and A. M.

Report available from NTIS, Springfield, Va., as Report Number ANL-8060, Part II. \$10.60 per copy, \$1.45 microfiche. In: Report ANL-8060 (Part II), p 278-288, July 1972-June 1973. 4 fig, 3 tab, 6 ref.

Descriptors: *Surveys, Measurement, *On-site data collections, *Idaho, *Radioactivity, Atmospheric pollution, Water pollution, *Soil contamination, Effluent, Nuclear powerplants, Cesium, Lead, Public health, Gamma rays.

Identifiers: Big Lost River(Ida), Plutonium.

Absolute environmental gamma-ray and meson dose rates were determined from measurements made in the vicinity of EBR-II. The detector used for the measurements was a 5-in. diameter sphere of liquid organic scintillator. Fourteen measure-ments were made at radial distances of up to 5 miles from the EBR-II effluent stack. The average external gamma-ray and meson dose rates determined were 6.0 microrad/hr and 4.5 mircorad/hr, respectively. Soil samples obtained at each of the measurement sites were later analyzed for gamma-ray emitters and for plutonium content. Other than nay emuters and for plutonium content. Other than aturally occurring radioactivity, only Cs-137 and Sb-125 seemed to be present in statistically significant amounts. No plutonium deposition pattern can be constructed from the limited number of analyses done. (Houser-ORNL) W74-04455

ENVIRONMENTAL RADIOACTIVITY.

L. I. Gedeonov.

Issue available from Plenum Pub. Corp., 227W 17th St., New York, N.Y. \$15.00 per copy. Soviet Atomic Energy Agency, Vol 33, No 2, Aug. 1972, p 760-765, Feb. 1973. Trans. from Atomnaya Ener-

Descriptors: Environment, Research and development, Ecology, *Air pollution, Water pollution, *Water pollution sources, Soil contamination, *Radioactivity, *Monitoring, Nuclear power-plants, Nuclear wastes, Mathematical studies, Geochemistry, Geophysics, Radiochemical analy-sis, Public health.

Studies of radioactive contamination of various media in the biosphere carried out at the Radium Institute over many years have made it possible to develop methods of investigation which are widely applicable at the present time. A large amount of data has been accumulated on the distribution of

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5B-Sources Of Pollution

radioactive contaminants in space and on the variation of their concentration in time. Certain relationships have been described mathematically; their interpretation was based on geophysical and geochemical factors. One can hope for future discovery and determination of the actual mechanism responsible for the observed relationships. It would then appear to be possible to evaluate the presumed radiation hazard from contamination of the seas and oceans. The capability of observing artificial and natural radioactive tracers now existing in nature should be used as an geochemical processes. (Houser-ORNL)
W74-04456

PHOSPHORUS RELATIONSHIPS IN RUNOFF

FROM FERTILIZED SOILS, Agricultural Research Service, Lafayette, Ind. M. J. M. Romkens, and D. W. Nelson. Journal of Environmental Quality, Vol 3, No 1, p 10-13, January-March 1974. 4 fig, 2 tab, 14 ref.

Descriptors: *Water pollution sources, *Phosphorus, *Fertilizers, *Phosphates, *Soil water movement, Erosion, Sediments, Path of pol-

The effect of fertilizer mixed into soil on the amount of phosphorus in runoff was studied. Ru-noff samples from artificial rainstorms on fallow plots of Russell sil soil, and P enriched soil-water mixtures (1:50) of Russell sil and other soils were analyzed for water soluble orthosphosphate and extractable, total, and organic P in sediment. The relation of P addition rate to the soluble orthosphosphate or sediment extractable phosphorus level in runoff was approximately linear. The relation of soluble orthophosphate to extractable P in soil-water systems was linear for most soils studied. Soluble orthosphosphate and extractable P in sediment were not related to total P or to organic P in sediment. A procedure is suggested for estimating the soluble orthophosphate concentration in runoff from fertilized wet soil using laboratory analyses. (Knapp-USGS) W74-04471

NUTRIENTS IN SUBSURFACE AND RUNOFF WATERS OF THE HOLLAND MARSH, ON-TARIO.

Ministry of the Environment, Rexdale (Ontario). Water Quality Branch. K. H. Nicholls, and H. R. MacCrimmon.

Journal of Environmental Quality, Vol 3, No 1, p 31-35, January-March 1974. 3 fig, 2 tab, 18 ref.

Descriptors: *Nutrients, *Path of pollutants, Water pollution sources, *Marshes, Soils, *Canada, *Fertilizers, *Nitrogen, *Phosphorus, Nitrates, Nitrites, Runoff. Identifiers: Holland Marsh(Ont).

Relative contributions to the river of nutrients (NO3, NO2, and total and soluble reactive phosphorus) and total electrolyte (specific conductance) were determined in surface runoff water pumped from both cultivated and uncultivated plots of muck soil within the Holland Marsh, Ontario. In addition, subsurface water from piezome ters installed in both cultivated and uncultivated marsh soil was analyzed throughout the growing season to determine fundamental differences in water chemistry and the extent of leaching of N and P under both cultivated and uncultivated conditions. The time and amount of rainfall are impor-tant in determining nitrate-N and to a lesser extent, soluble reactive P concentrations in subsurface water beneath the cultivated plot but not beneath the uncultivated plot. The mean concentration (0.75 mg/liter) of inorganic N in subsurface water under the cultivated plot was about 10 times higher than under uncultivated marsh during the growing season. The combined effects of fertiliza-tion, drainage and hence oxidizing and nitrifying conditions yielded 4 to 5 times more P (1.56 kg P/ha) and 40 to 50 times more nitrate-N (4.1 kg N/ha) in runoff water from the cultivated than from the uncultivated plot. From the cultivated plot the nutrients are lost to the river during a 5 to 6 week pumping period during the spring and more than 90% of the total P in runoff is in the soluble reactive form (as opposed to only 45% from the uncultivated marsh) and is, therefore, readily available for algae and aquatic plant growth in the lower Holland River and Cook Bay of Lake Sim-coe. (Knapp-USGS) W74-04478

QUANTITY AND CHEMICAL QUALITY OF LOW FLOW IN THE EAST FORK SAN JACIN-TO AND WEST FORK SAN JACINTO RIVERS NEAR HOUSTON, TEXAS, JUNE 24, 26, 1969, Geological Survey, Austin, Tex. J. C. Fisher, and G. Ramos.

Open-file report, December 1973, 21 p, 3 fig, 6 tab,

Descriptors: *Water quality, *Low flow, *Texas, Streamflow, *Hydrologic data, Data collections, Identifiers: *San Jacinto River(Tex).

Low-flow data were collected June 24, 1969, on an 18.0-mile reach extending downstream from the gaging station East Fork San Jacinto River near Cleveland, Texas. On June 24, and 26, low-flow data were collected on a 37.3-mile reach extending downstream on the West Fork San Jacinto River from 0.7 mile below the proposed Lake Conroe dam site. Changes in chemical quality of water in the East Fork San Jacinto were minor. Water discharged into Lake Houston contained 153 mg/liter dissolved solids and 54 mg/liter chloride. Flow in the East Fork San Jacinto River increased from 16.0 cfs to 21.2 cfs in the study reach. Discharge measurements indicate a losing reach in the upper 3.7 miles and a gaining reach in the remaining 14.3 miles. Changes in chemical quality of water in the West Fork San Jacinto were minor. Water discharged into Lake Houston contained 242 mg/liter dissolved solids and 80 mg/liter chloride. Flow in the West Fork San Jacinto increased from 2.03 to 36.5 cfs in the study reach. Discharge measurements indicate three losing and six gaining subreaches. (Knapp-USGS) W74-04481

RELATIVE SUSCEPTIBILITY OF LAKES TO WATER-QUALITY DEGRADATION IN THE SOUTHERN HOOD CANAL AREA, WASHING-TON,

Geological Survey, Tacoma, Wash. G. C. Bortleson, and B. L. Foxworthy Open-file report, 1973. 11 p, 1 fig, 1 plate, 9 ref.

Descriptors: *Lakes, *Water pollution sources, *Washington, Land use, Septic tanks, Path of pollutants, Water pollution effects, Limnology, *Biodegradation, Chemical degradation. Identifiers: Hood Canal area(Wash).

Techniques were devised to allow a rapid assessment of conditions pertaining to water quality in the lakes in the southern Hood Canal area of Washington. The main objective of this study was to evaluate lakes in the area as to their relative susceptibility to water-quality degradation from natural and man-related causes. Under natural conditions the lakes were surrounded by conifer forests; most are still bordered by woodlands, some of which are in a period of regrowth after timber harvesting. All the lakes studied that have a surface area greater than 20 acres and about onehalf the smaller lakes have surface-water outlets at least during periods of high water. Man has accelerated the natural lake aging principally through increased sedimentation, resulting from logging and construction in the lake's drainage area, and enrichment of the water with nutrient substances, such as compounds of nitrogen and phosphorous. Soil and rock materials in the lake drainage basin

are a major control on the chemical character of lake water under natural (undeveloped) condi-tions. Lake depth is the most significant physical feature affecting the ability of a lake to produce and assimilate nutrients. Because virtually all domestic wastes are dispersed through septic-tank systems, groundwater contaminated with septic-tank effluent has become a principal source of nutrients for lakes with populated shorelands. (Knapp-USGS) W74-04488 and assimilate nutrients. Because virtually all

APPLICATION OF THE CONCEPT OF RECTILINEAR VORTICES TO THE MOVE-

MENT OF OIL SLICKS,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
T. S. Murty, and M. L. Khandekar.
Manuscript Report Series No 32, 1973. 26 p, 6 fig.

Descriptors: *Oil spills, *Path of pollutants, *Numerical analysis, *Vortices, Mathematical models, Currents(Water), Winds, *Canada.

The concept of rectilinear vortices was applied to The concept of rectlinear vortices was applied to study the movement of oil slicks in general, particularly in the Strait of Georgia, British Columbia. The formulation of the problem under this concept led to a set of ordinary first order differential equations which were solved using Hamming's modified predictor-correction method. Although numerical models alone cannot predict the detailed movement of oil slicks, at least they can be used to assess some gross features of the motion. The concept of rectilinear vortices is useful in computing the horizontal trajectories of individual slicks. If the current is small, then the mutual interactions of the slicks are very important in determining the trajectories. (Knapp-USGS) W74-04490

A PROPOSAL FOR THE INVESTIGATION OF POSSIBLE GROUND-WATER CONTAMINA-TION IN THE BANGOR AREA, KITSAP COUN-TY, WASHINGTON, Geological Survey, Tacoma, Wash.

Open-file report, 1974. 24 p, 1 fig, 3 tab, 10 ref.

Descriptors: *Water pollution sources, *Path of pollutants. *Groundwater movement. pollutants, *Groundwater movement, *Explosives, Malenclaves, Pit recharge, Waste water disposal, Hydrogeology.
Identifiers: *TNT, *RDX(Cyclonite).

From 1966 to 1970 as a result of steam cleaning of explosive projectiles, explosive wastes were disposed through groundwater recharge. The Navy estimates that between 1966 and 1970 about 50,000 pounds of the explosives TNT (trinitrotoluene) and RDX (cyclonite) were routed to a shallow unlined pit in the ground. Because the disposal pit is in a recharge area of an aquifer used disposal pit is in a recharge area of an aquifer used for domestic water supplies, and explosives residues in water may be poisonous, the Navy became concerned with the environmental consequences of the disposal practice. The Geological Survey's proposal for the investigation is described. In Phase I, the initial step covered by this report, the Geological Survey (1) drafts a statement of the problem, (2) defines the scope of the entire study (including Phases II and III), (3) specifies the expected study output, and (4) provides an estimate of the time and costs involved. (Knapp-USGS) (Knapp-USGS) W74-04491

ENVIRONMENTAL CHEMISTRY: AIR AND WATER POLLUTION,

Weber State Coll., Ogden, Utah. Dept. of Chemis-

H. S. Stoker, and S. L. Seager. Scott, Foresman and Co., Glenview, Illinois (and London, England). 1972. 186 p.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Sources Of Pollution-Group 5B

Descriptors: *Engineering education, *Water pollution, *Air pollution, *Waste water treatment, Water pollution sources, Pollutant identification, Pollution abatement, Mercury, Detergents, Pesticides, Oil spills, Temperature, Meteorology, Ther-

This introductory text on the chemistry of water and air pollutants comprises 14 chapters, each with further reading references. They are devoted to the general aspects of pollution (sources, types, to the general aspects of pollution (sources, types, and measurement); specific pollutants (such as mercury, detergents, pesticides, oil spills, etc.); temperature inversions (greenhouse effect); and waste water treatment. (Brown-IPC) W74-04513

BIOCHEMICAL ECOLOGY OF WATER POL-

LUTION, Ohio State Univ., Columbus. Dept. of Microbiolo-

gy. For primary bibliographic entry see Field 5C.

CHARACTERISTICS OF PULP AND PAPER MILL WASTES AND ISI STANDARDS, Central Public Health Engineering Research Inst.,

Nagpur (India). P. V. R. Subrahmanyam, R. C. Parekh, and G. J.

IPPTA (Journal of the Indian Pulp and Paper Technical Association), Vol 9, No 1, p 31-39, January-March 1972. 10 tab, 17 ref.

Descriptors: *Pulp and paper industry, *Water pollution sources, Discharge(Water), *Pulp wastes, Effluents, Biochemical oxygen demand, Suspended solids, Water consumption(Except consumptive use), *Mercury, Pollutants, Monitoring, *Water quality standards.

The growth of the Indian pulp, paper, strawboard, and newsprint industry during the past two decades was accompanied by increased volumes of discharged effluents. Depending on water con-servation measures practiced by various mills, ef-fluent discharges may vary considerably. In a well nuent discharges may vary considerably. In a wein operated integrated pulp and paper mill, they may amount to 227 to 272 cu m per ton of paper made and contain 34.5 kg of BOD and 87.7 kg of suspended solids. Effluents from straw pulp and board mills contain ca. 79.5 kg BOD and 224 kg suspended solids per ton of product. Newsprint suspended solids per ton of product. Newsprint mill discharges average 50.3 kg BOD and 83.3 kg solids per ton. Assuming an average discharge of 50,000 gal per ton of product for all kinds of paper, 30,000 gai per ton of product for an kinds of paper, the resulting daily discharge of ca. 87 million gal would be equivalent to the sewage output of a population of 3 million people. Pollution tolerance limits for several industrial effluents are tabulated. The most important, because most toxic, pollutant to be monitored in mill effluents is mercury. (Wise-IPC) W74-04530

WATER POLLUTION IN THE NETHERLANDS, Instituut voor Grafische Techniek TNO, Amsterdam (Netherlands).

J. F. Monroy.
In: Proceedings of IARIGAI (International Association of Research Institute of the Graphic Arts Industries) Symposium on Environmental Control Problems, Stockholm, Sweden, September 25-26, 1972. Grafiska Forskningslaboratoriet, Stockholm, p 23-31 (1972), 1 tab.

Descriptors: *Water pollution sources, *Industrial wastes, *Chemical industry, Europe, Photography, Solvents, Pigments, Binders, Regulation, Pollution abatement, Waste water treatment, Effluents, Costs.
Identifiers: *Netherlands, Graphic arts, *Printing

industry, Silver compounds, *Inks.

Sources of water pollutants in the Dutch graphic arts industries include photoengraving, lithographic platemaking, gravure printing, silve-based photography, and other processes and operations. Ink components contributing to pollution include pigments, binders, and solvents. Technological problems, costs, planning, and regulatory control of effluent treatment and discharge in the Nether-lands are outlined. (Brown-IPC) W74-04536

A PRELIMINARY SURVEY OF THE POSSIBLE CONTAMINATION OF LAKE NAKURU IN KENYA WITH SOME METALS AND CHLORINATED HYDROCARBON PESTI-

Utrecht Rijksuniversiteit (Netherlands). Inst. of Veterinary Pharmacology and Biological Toxicology.

For primar W74-04547 imary bibliographic entry see Field 5C.

ENVIRONMENTAL IMPACT
-POWER PLANT COOLING REVIEWING SYSTEMS, ENGINEERING ASPECTS,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg. For primary bibliographic entry see Field 5G. W74-04555

SOME NEGLECTED SOURCES OF WATER POLLUTION (NEDOSTATOCHNO UCHITYVAYEMYYE ISTOCHNIKI ZAGRYAZNENIYA PRIRODNYKH VOD),

A. I. L'vovich. Vodnyye Resursy, No 3, p 125-130, 1973. 3 tab, 10

Descriptors: *Water pollution sources, Water pollution, Waste water(Pollution), *Farm wastes, *Pesticide residues, *Fertilizers, *Industrial wastes, *Mine water, Sediments.
Identifiers: *USSR.

Water pollution sources generally disregarded, or inadequately treated in the literature on water pollution control, are examined. These sources in-clude: (1) conditionally clean waters of industrial clude: (1) conditionally clean waters of industrial enterprises; (2) mine waters; (3) surface runoff from populated and industrialized areas and from croplands treated with pesticides and mineral and organic fertilizers; (4) farm wastes; and (5) sediments carried off from eroded lands. Rational and efficient use of water resources and their protection from contamination can be realized only through broad implementation of water conserva-tion measures actively supported by water users themselves. (Josefson-USGS) W74-04579

HYDROGEOLOGIC CONSIDERATIONS IN SOLID WASTE STORAGE IN IOWA: PART 1. SANITARY LANDFILL SITE SELECTION: PART 2. A METHOD OF HAZARDOUS AND TOXIC WASTE DISPOSAL, Geological Survey, Iowa City, Iowa. For primary bibliographic entry see Field 5E. W74-04592

EFFECTS OF BACKPUMPING FROM SOUTH NEW RIVER CANAL AT PUMP STATION S-9 ON QUALITY OF WATER IN WATER-CON-SERVATION AREA 3, BROWARD COUNTY, FLORIDA, Geological Survey, Tallahassee, Fla.

H. J. Freiberger. Open-file report 73026, 1973. 64 p, 23 fig, 3 tab, 6

Descriptors: *Water quality, *Canals, *Florida, *Dissolved oxygen, Water conservation, Water management(Applied), Water pollution sources, Path of pollutants, Water quality control,

Hydrologic data, Pumping, Water levels, Flow control, Flood control, Water analysis, Chemical analysis, Biochemistry, Trace elements. Identifiers: Broward County(Fla), *Backpumping, Ammonia nitrogen

The quality of water in Water-Conservation Area 3 (Broward County, Florida) is affected by backpumping from the South New River Canal at pump station S-9, as indicated by marked decreases in dissolved oxygen and increases in ammonia nitrogen in the canals of the conserva-tion area. Decreases in dissolved oxygen im-mediately above S-9 of as much as 5.8 mg/liter were recorded after backpumping and effects in the canals of the conservation area were detected as far as 3 miles from S-9. Increases in ammonia immediately above S-9 of as much as 01.26 mg/liter were recorded after backpumping. The low dissolved oxygen, as low as 0.20 mg/liter, and the high ammonia, an average of 0.38 mg/liter (NH3-N), in South New River Canal below S-9 result from the large groundwater contribution that oc-curs with backpumping. The areal extent and period of degradation in Water-Conservation Area 3 from backpumping is dependent mainly on the amount of flow released from Water-Conservation Area 2, which dilutes and flushes backpumped water. Concentrations of potential contaminants including toxic metals, pesticides, and nutrients, especially phosphorus, are relatively low in the area of South New River Canal affected by backpumping. (Woodard-USGS) W74-04600

HYDROLOGIC AND GEOLOGIC CONSIDERA-TIDNS FOR SOLID-WASTE DISPOSAL IN WEST-CENTRAL FLORIDA, Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 5E. W74-04605

WATER QUALITY RECORDS FOR THE HUB-BARD CREEK WATERSHED, TEXAS, OC-TOBER 1969-SEPTEMBER 1972,

Geological Survey, Austin, Tex. H. J. Davidson.

Open-file report (Texas District), 1973. 81 p. 2 fig.

Descriptors: *Water quality, *Reservoirs, *Texas, *Data collections, *Hydrologic data, Sampling, Chemical analysis, *Electrical conductance. Identifiers: Hubbard Creek watershed(Tex).

Since February 1962, a network of daily chemicalquality and streamflow stations has been operated in the Hubbard Creek watershed, Texas. Daily specific conductance is measured and selected samples are chosen for chemical analysis depend-ing on the amount of flow at the time of sampling. and on the amount of flow at the time of sampling.

A compilation is presented of the records for the period October 1969 to September 1972. Periodic surveys of Hubbard Creek Reservoir are made to study salinity stratification. (Knapp-USGS) W74-04606

HYDRAULIC MODEL EXPERIMENT ON THE DUFFUSION DUE TO THE COASTAL CUR-RENT.

Kyoto Univ. (Japan). Disaster; Prevention Research Inst.

H. Higuchi, and Y. Iwagaki.

In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, Sep-tember 1968, American Society of Civil Engineers, Vol 2, Part 4, Chap 87, p 1357-1376, 1969. 13 fig, 3

Descriptors: *Harbors, Tidal effects. Descriptors: "Harbors, Tidal effects, "Currents(Water), Density, Circulation, Waste disposal, Water pollution sources, Diffusion, Coasts, "Hydraulic models, "Path of pollutants. Identifiers: "Japan(Kashima Harbor), "Longshore currents, "Tidal currents.

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5B-Sources Of Pollution

The diffusion phenomena due to the tidal current and the longshore current inside and outside a har-bor are studied in a hydraulic model experiment, for which the Kashima Harbor area is used as the prototype. The tidal current, the longshore current and the effect of density are taken into account, but the direct effects of wind and waves are not considered. A model of Kashima Harbor was constructed, and a semidiurnal tide generated by an automatically controlled pneumatic tide generator and longshore current by a water circulating system were provided for it. The water level at 4 stations and current pattern were measured. The diffusion of dyed water from instantaneous point sources and a continuous point source was investigated by the photographic method and dye concentration analysis. (Sinha-OEIS) W74-04628

BUOYANCY SPREAD OF WASTE WATER IN COASTAL REGIONS, Vattenbyggnadsbyran Ltd., Stockholm (Sweden).

I. Larsen, and T. Sorensen.

In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968, American Society of Civil Engineers, Vol 2, Part 4, Chap 89, p 1397-1402, 1969. 3 fig, 3

Descriptors: Waste water(Pollution), Density, *Buoyancy, Water pollution sources, Winds, *Heated water, Turbulence, Diffusion, *Waste dilution, Sewage, *Outfall sewers, *Path of pollu-

Waste water may, due to buoyancy effects, spread horizontally on top of the recipient. The spreading is chiefly determined by the buoyancy flux and to a large extent is unaffected by dilution and diffusion. This phenomenon is of great practical importance for larger outfalls of waste or cooling water in coastal regions. The theory presented takes into account the vertical turbulent diffusion and shows that the spreading of waste water due to density differences is determined chiefly by the buoyancy flux and to a large extent is unaffected by dilution and diffusion. The theory may be expected to give results of the correct order of mag-nitude. Calculations for outfalls from larger cities will show that the places normally considered shel-tered from the outfall zone by a region of con-siderable turbulent diffusion may in some cases by successful that that the source date is polluted by poorly diluted waste water. The influence of wind may add significantly to this effect. (Sinha-OEIS) W74-04630

THE USE OF COMPUTER SIMULATIONS FOR SYSTEMS ECOLOGICAL STUDIES IN THE BALTIC.

BALTIC, Stockholm Univ. (Sweden). Asko Lab. S. Sjoberg, F. Wulff, and P. Wahlstrom. Ambio. Vol 1, No 6, p 217-222. 1972, Illus. Identifiers: *Baltic Sea, Computer Ecological studies, Flow, Model *Oxygen, *Phosphorus, *Simulation Identifiers: *Baltic Sea Ecological studies, Fl *Oxygen, *Phosphorus, Systems analysis. models. studies.

A model describing the P and O2 flows of the Baltic is presented. Different perturbations of these flows were simulated on a computer, and the results are discussed. The aim of the model is to get a better understanding of which processes are the most critical for the behavior of the Baltic as a whole. The release of phosphate from reduced sediments and the water exchange with the Kat-tegatt were vital features of the simulated system.--Copyright 1973, Biological Abstracts, Inc. W74-04634

THE RELATION BETWEEN PHYTOPLANK-TON AND PHOSPHATE IN THE LAKE OF CONSTANCE, (IN GERMAN),

Staatliches Institut fuer Seenforschung und Seen-bewirtschaftung, Konstanz (West Germany). Abteilung Max Auerbach-Institut.

For primary bibliographic entry see Field 5C. W74-04637

URBANIZATION: HYDROLOGICAL HEADACHE, Lund Inst. of Tech. (Sweden).

For primary bibliographic entry see Field 4C. W74-04642

POLLUTED SNOW IN SOUTHERN NORWAY DURING THE WINTERS 1968-1971,

Oslo Univ. (Norway). Zoological Lab K. Elgmork, A. Hagen, and A. Langeland. Environ Pollut. Vol 4, No 1, p 41-52. 1973. Illus. Identifiers: Acid, Heavy metals, *Lead, *Norway, Pressure, *Snow, *Sulfur, Winters, *Air pollution, Water pollution sources.

In recent yrs, the snow in southern Norway was laminated with conspicuous grey bands which were considerably more acid, had a higher electri-cal conductivity and larger amounts of S, heavy metals and other elements than the white lavers of the snow. These bands indicate a considerable airborne pollution with values of S up to 8.5 mg/1 and of Pb up to 98 microgram/liter, and with pH values down to 3.25 in the melt water. The chemical stratification in the snow was preserved throughout the winter in areas with a cold climate. A regional study of the snow in late winter may thus give information of the distribution of air borne pollution. The acidity and contents of chemical substances in the snow was too high and found over too wide an area to be produced in Norway. The pollution was probably brought in by low pressure systems from the great industrial and urban areas in western and central Europe.--Copy-right 1973, Biological Abstracts, Inc. W74-04652

ZONE OF FLOW ESTABLISHMENT FOR ROUND BUOYANT JETS, Oak Ridge National Lab., Tenn.

E. Hirst.

Water Resources Research, Vol 8, No 5, p 1236-1246, October 1972. 12 fig, 20 ref.

*Jets. *Buoyancy, Descriptors: *Mixing. *Effluent streams, Density, Flow, Diffusion, Heated water, Temperature, Thermal powerplants, Water temperature, Hydraulics, *Thermal pollution, Water pollution, Mathematical models, Entrainment, Jets.

Identifiers: *Zone of flow establishment, Dif-

A method is developed to predict physical proper-ties within the zone of flow establishment (ZFE) for thermal effluents discharged as buoyant jets through round submerged diffuses. The ZFE is the region immediately beyond the diffuser exit in which the mean flow profiles undergo a transition from their internal flow shapes to a free turbulent flow condition. The integral equations of mass, energy, and momentum conservation are used The solution includes the length of the ZFE and the values of jet width, jet orientation, and center line temperature throughout this zone. The method can predict buoyant jets with three-dimensional trajectories discharged to flowing stratified ambients. Results obtained with the method agree well with the limited experimental data available and with existing empirical correlations. These results provide the necessary initial conditions for conventional (applicable only in the zone of established flow) jet predictions methods; and thus the accuracy of hydrothermal predictions of thermal effluents from power plants will be im-proved. (Oleszkiewicz-Vanderbilt) W74-04657 DETAILED TIME VARIATIONS IN MEAN TEMPERATURE AND HEAT CONTENT OF SOME MADISON LAKES, State Univ. of New York, Buffalo. Dept. of Biolo-

For primary bibliographic entry see Field 2H. W74_04659

ON THE STABILITY OF LAMINAR PLUMES: SOME NUMERICAL SOLUTIONS AND EX-PERIMENTS, Cornell Univ., Ithaca, N.Y. Dept. of Mechanical

Engineering. L. Pera, and B. Gebhart.

International Journal of Heat and Mass Transfer, Vol 14, No 7, p 975-984, 1971, 6 fig, 10 ref.

Descriptors: *Laminar flow, *Jets, *Stability, *Buoyancy, Fluid mechanics, Heat transfer, Mass transfer, Flow, Turbulence, Stratification, Thermal properties, Temperature, Stream flow, Numerical analysis, Model studies, Boundary layers, Vigogitius Viscosity. Identifiers: *Inviscid instability, *Laminar

An investigation of the hydrodynamic stability of a laminar plume arising from a horizontal line source of heat was carried out using the Tollmien-Schlichting theory of small disturbances. Inviscid solutions of the Orr-Sommerfeld equation were obtained for both symmetric and asymmetric disturbances and the effect of the Prandtl number on the inviscid stability was calculated for asymmetric disturbances. The base flow was found to be less stable for the asymmetric mode. In addition, the full disturbance momentum equations, coupled and uncoupled from the energy equation, were numerically integrated with the boundary conditions appropriate for asymmetric disturbances superimposed on the symmetric plume base flow. Neutral stability curves have been obtained in terms of the Grashof number. The predominance of the assumed asymmetric mode of flow oscillation was verified experimenmode of flow oscillation was verified experimen-tally by perturbing a plume, in air, with a vibrating ribbon. The experimental results demonstrate that sufficiently high frequency disturbances are stable as they are convected downstream. (Jerome-Van-derbilt) W74-04662

THE THERMAL REGIME OF LAKE LANAO (PHILIPPINES) AND ITS THEORETICAL IM-PLICATIONS FOR TROPICAL LAKES, Indiana Univ., Bloomington. Dept. of Zoology. For primary bibliographic entry see Field 2H.

W74-04665

ANALYTICAL METHODS OF SOLUTION OF CONJUGATED PROBLEMS IN CONVECTIVE

HEAT TRANSFER,
Akademiya Navuk BSSR, Minsk. Inst. of Heat
and Mass Transfer. For primary bibliographic entry see Field 8B. W74-04667

HEAT - A GROWING WATER POLLUTION PROBLEM, S C Bloom

Environmental Reporter, Vol 1, No 1, Monograph 4, p 1-21, May 1, 1970. 4 tab.

Descriptors: *Thermal pollution, *Cooling water, Descriptors: "Inermal polution, "Cooling water, "Thermal powerplants, "Reviews, Cooling, Resources, Water resources, Water pollution sources, Electric power production, Aquatic en-vironment, Aquatic life, Legislation, Biological community, Water temperature, Fish, Standards, Administration, Research and development, Mixing, Stratification, Dispersion, Climates. Identifiers: *Thermal discharges.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Sources Of Pollution—Group 5B

Thermal pollution has become a matter of growing conern as the industrial demand for water for cooling and condensing has increased. Electric power production accounts for more than four-fifths of total cooling water use and nearly one-third of all water use. Temperature affects nearly every water use. Temperature affects nearly every physical property of concern in water quality management including density, viscosity, vapor pressure, surface tension, gas solubility, and gas diffusion. The reduction in the solubility of oxygen is probably the most important of these effects, as an adequate supply of dissolved oxygen is essential in biological degradation of organic matter in an aerobic environment. While extreme temperatures are lethal to many organisms, moderately raised temperatures may affect the metabolic rates, growth, reproduction and distribution of many aquatic species. Recorded fish kills and other adverse effects due to thermal pollution are discussed. Various federal and state regulatory agencies and codes are generally organized around the amount of temperature increase allowed and the size of the heated-water mixing zone. Limiting temperature criteria in water quality standards for interstate waters are presented. Present research programs are reviewed and alternatives to heat discharge are considered. (Jerome-Vanderbilt) W74-04668

SPECTRA OF THE TEMPERATURE AND HU-MIDITY FLUCTUATIONS AND OF THE FLUXES OF MOISTURE AND SENSIBLE HEAT IN THE MARINE BOUNDARY LAYER, Oregon State Univ., Corvallis. Dept. of Oceanog-

raphy. For primary bibliographic entry see Field 2E. W74-04672

THE APPLICATION OF NUMERICAL SIMULA-TION MODELS IN THE ASSESSMENT OF THE EFFECT OF DISCHARGES INTO COASTAL WATERS,

RAND Corp., Santa Monica, Calif.

Rand Paper No 4948, January 1973. 3 p, 5 ref.

Descriptors: *Discharge(Water), *Mathematical models, *Water quality, *Finite element analysis, Computer models, Thermal powerplants, Nuclear powerplants, Momentum equation, Continuity equation, Cooling water, Temperature, Water pollution, Water temperature, Estuaries, Sea water, Numerical analysis, *Simulation analysis. Identifiers: Rand water quality model, Coastal

A water quality simulation model was developed for use in well-mixed estuaries and coastal seas. The model is based on the numerical solution by finite difference techniques of the two-dimen-sional vertically integrated equations of motion and continuity for a fluid. The use of this model is suggested to determine how the discharges from an offshore or coastal nuclear plant would affect the ecology of the receiving waters. These effects consist mainly of an increase in temperature and addition of materials to the water during its passage through the plant for cooling purposes. A passage through the plant for cooling purposes; model of this type can supply the quantitative in-formation if sufficient field data are available. (Oleszkiewicz-Vanderbilt) W74-04674

PRINCIPLES OF EVALUATING EFFECTS OF THERMAL DISCHARGES ON SURFACE WATERS (GRUNDLAGEN FUR DIE BEUR-TEILUNG DER WARMEBELASTUNGEN VON GEWASSERN).

Landerarbeitsgemeinschaft Wasser, Mainz (West Germany).

For primary bibliographic entry see Field 5C. W74-04764

HYDROCARBON AND CHLOROPHYLL: A CORRELATION IN THE UPWELLING REGION OFF WEST AFRICA,
(West Germany). Institut fuer

Meereskunde. A. Zsolnav.

Deep-Sea Research, Vol 20, No 10, p 923-925, October 1973. 1 fig. 8 ref.

Descriptors: *Organic compounds, *Chlorophyll, *Phytoplankton, *Sea water, Separation techniques, Upwelling, Analytical techniques, Euphotic zone, Sampling, Statistical methods, Data processing, Adsorption, Water pollution sources, *Atlantic Ocean.

Identifiers: *Data interpretation, Sample prepara-

Seawater samples were taken from 17 stations off West Africa for analysis of hydrocarbon and chlorophyll a content to investigate their possible relationship. Samples were taken in the euphotic zone, usually at 4, 10, 17 and 35 m. The hydrocarbons were extracted from the sea water by shaking each of two 1-litre aliquots of the sample with 10 ml hexane. The extracts were combined and concentrated under vacuum until their volume was 300 microliters. Fifty microliters were then injected on a 10 cm column with a 1.8 mm i.d. containing 0.05-0.2 mm silica gel that had been 5 per-cent (w/w) deactivated with distilled water. The heat of adsorption detector consisted of two thermistors, one surrounded by an inert material while the other was packed in a material capable of adsorbing hydrocarbons. The resulting heat of adsorption was than a measure of the amount of hydrocarbons present and resulted in one sharp peak within two minutes after injection. Amounts as small as 1 microgram hydrocarbon could be determined with fresh graphite as the adsorbent. A significant linear correlation between the non-aromatic hydrocarbons and the chlorophyll-a content in the euphotic zone of the water off West Africa existed between 4 March and 10 March 1972. This showed that the hydrocarbons present were the result of phytoplankton activity. The line of the estimating equation tended to go through the origin, indicating that the hydrocarbons in the euphotic zone were not due to a pollution source. (Mortland-Battelle) W74-04771

LABORATORY STUDIES OF THE ACCOMMODATION OF SOME CRUDE AND RESIDUAL FUEL OILS IN SEA WATER,

Bedford Inst., Dartmouth (Nova Scotia). D. C. Gordon, Jr., P. D. Keizer, and N. J. Prouse. Journal of the Fisheries Research Board of Canada, Vol 30, No 11, p 1611-1618, November 1973. 5 fig, 6 tab, 11 ref.

Descriptors: *Laboratory tests, *Sea water, *Oil pollution, *Oil wastes, Turbulence, Water temperature, Chemical analysis, Gas chromatography, Oil spills, Organic compounds, Water pollution sources.

Identifiers: Crude oil, Residual fuel oil, Accomodation, *Fate of pollutants, Particulate oil, Subparticulate oil, Aliphatic hydrocarbons, Petroleum hydrocarbons, Flame ionization gas chromatography, Fuel oil, Fluorescence spectrophotometry, Gas liquid chromatography.

To understand more fully the potential availability of petroleum hydrocarbons to marine organisms inhabiting the water column (both in the natural environment and in experimental situations devised to test the effects of hydrocarbons), a series of laboratory experiments were undertaken to study the accommodation of three different types of oil in seawater under different experimental conditions. Concentrations of oil accommodated in seawater under laboratory conditions are directly related to the amount added and the degree of turbulence, but inversely related to temrature. The major fraction (87-98 percent) of this oil is in particulate form ranging in size from about 1 to 30 microns, presumably small droplets. The exact ratio of the particulate to subparticulate fractions is directly related to the apparent viscosity of each individual oil. Of the total amount of oil initially added, 9-15 percent appeared in seawater at the end of the 7-days experiments. Except in the proximity of recent oil slicks, the oil concentrations observed in these experiments are one to two orders of magnitude greater than the concentra-tions generally observed in the marine environment off eastern Canada. (Holoman-Battelle) W74-04775

HETEROTROPHIC UTILIZATION OF SUCROSE IN AN ARTIFICIALLY ENRICHED

Manitoba Univ., Winnipeg. Dept. of Microbiology. For primary bibliographic entry see Field 5C. W74-04781

MEASUREMENT OF ADENOSINE TRIPHOSPHATE (ATP) IN TWO PRECAMBRI-AN SHIELD LAKES OF NORTHWESTERN ON-

Fisheries Research Board of Canada, Winnipeg

(Manitoba). Freshwater Inst. J. W. M. Rudd, and R. D. Hamilton.

Journal of the Fisheries Research Board of Canada, Vol 30, No 10, p 1537-1564, October 1973. 8 fig 1 tab 16 ref

Descriptors: *Primary productivity, *Secondary productivity, *Lakes, Measurements, Separation techniques, Filtration, Water analysis, Sampling, Particle size, Carbon, *Canada, Chlorophyll.

Identifiers: *Adenosine triphosphate, Sample preparation

Water samples were collected in Van Dorn bottles from lakes 227 and 302 in the precambrian shield area of northwestern Ontario for analysis of ATP over several months. Samples were filtered through a 250-micron net and three subsamples prepared for extraction by passing through a 0.22-micron, 47-mm GS Millipore filter and 10-micron and 56-micron nylon mesh filters. ATP analyses were performed under diffuse incandescent light in modified glass scintillation vials. Large seasonal changes were evident, as were specific sites of high biological activity due either to natural stratification or to deliberate manipulation. Chlorophyll a, particulate carbon, and direct count data were found to be misleading in specifying the changes or the sites of biological activity. Analysis of the ATP data on the basis of the relative abundance of different size fractions was found to be useful. An ATP filtration error could not be demonstrated, indicating that cell breakage is not a source of the filtration error inherent in some C-14 primary and secondary productivity studies. (Little-Battelle)

MOVEMENTS OF PHOSPHORUS BETWEEN ITS BIOLOGICALLY IMPORTANT FORMS IN

LAKE WATER,
Department of Energy, Mines and Resources,
Burlington (Ontario). Canada Center for Inland

D. R. S. Lean.

Journal of the Fisheries Research Board of Canada, Vol 30, No 10, p 1525-1536, October 1973. 9 fig. 2 tab. 18 ref.

Descriptors: *Phosphorus, *Path of pollutants, *Lakes, *Epilimnion, *Kinetics, *Cycling *Lakes, *Epilimnion, *Kinetics, *Cycling nutrients, Movement, Model studies, Freshwater, Phosphates, Phosphorus radioisotopes, Filtration, *Organophosphorus compounds, Radioactivity, Ion exchange, Eutrophication, Anionic exchange. Identifiers: Orthophosphates, Molecular weight, Particulate matter, *Dissolved phosphorus, Mem-brane filters, Transfer rates, Heart Lake, Colloidal phosphorus.

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5B-Sources Of Pollution

A model consistent with the kinetics of phosphorus in epilimnetic lake water was developed. Adding P-3204 to lake water and the major forms separating phosphorus by Sephadex gel filtration showed that the exchange mechanism between inorganic phosphate and the particulate fraction predominates. At the same time, a low-molecularweight phosphorus compound is excreted which combines with colloids in lake water, releasing phosphate from the colloid and making the phosphate available for 'transfer' again. This rapid cycling of phosphorus between the four principal forms - the particulate fraction, the low-molecular-weight P compound, colloidal P, and phosphate-appears to contribute to formation of colloids in lake water. No direct complexing of phosphate to the colloid was observed. Only in the presence of algae, bacteria, and other particulate matter did the radioactive phosphorus move to the lowmolecular weight and the colloidal forms. The lowmolecular-weight compound is negatively charged, as is the colloidal P, but to a lesser degree. Both are removed by anion exchange materials along with phosphate, but the rate that they move into the fraction removed by membrane filtration is different from that for phosphate. This complicates measurements of transfer and makes previous studies on utilization of dissolved organic phosphorus of doubtful value since corrections for filter retention were rarely, if ever, made. (Holoman-Battelle)

DISTRIBUTION AND UPTAKE OF ARTIFICIALLY INTRODUCED RADIUM-226 IN A SMALL LAKE,

Lamont-Doherty Geological Observatory. Palisades, N.Y.

S. Emerson, and R. Hesslein.

Journal of the Fisheries Research Board of Canada, Vol 30, No 10, p 1485-1490, October 1973. 3 fig, 1 tab, 12 ref.

Descriptors: *Lake sediments, *Absorption, Ecological distribution, *Detritus, *Canada, Chemical analysis, *Path of pollutants, *Radium radioisotopes, Littoral, Diatoms, Aquatic algae, Deep-water habitats, Water analysis, Adsorption, Bottom sampling, Water sampling, Radioactivity techniques, Lakes.
Identifiers: Ra-226, Epilithophyton, Gas exchange

rates, Algal counts, Pollutant removal, Rn-222.

Radium-226 was added to lake 227 of the Experimental Lakes Area in August, 1970, so that gas-exchange rates between the atmosphere and the lake could be traced by its gaseous daughter product radon-222. Although the radium was expected to remain in solution it did so for only about 1 month. An investigation was made to locate the radium after it left solution. Water and deep water surface sediment samples and algal (epilithophyton) and detrital material were analyzed in order to determine radium distribution. Since Ra was found to be highly concentrated in rock scrapings, an attempt was made to corre-late Ra uptake with epilithophyton carbon fixation. Algal-detrital material from nonlabelled lakes (lakes 239-and 240) with natural radium activities (0.1 dpm/liter) was analyzed for Ra by liquid scintillation counting in a dioxane fluor. In lake 227 radon activity decreased toward the center, thus confirming that the radon source was the littoral zone. Radium activity of rock scrapings and surface sediment further indicated that radium was concentrated on the littoral bottom surface. Results of two successive scrapings of the same rocks from lake 227 showed that the radium analyzed in these scrapings was concentrated in the algal or detrital coating of the rock and not from the rock itself. Two years after labelling lake 227, activities in the surface sediments below 8 m were as high as 660 dpm/g of dried sediment. Radi-um uptake had no relation to the carbon fixation rate. Laboratory tests determining radium removal rate indicated no significant difference between removal by unaltered algal-detrital material and boiled algal-detrital material. (Holoman-Battelle) W74-04785

A NUMERICAL MODEL FOR DETERMINING INTEGRAL PRIMARY PRODUCTION AND ITS APPLICATION TO LAKE MICHIGAN, Wisconsin Univ., Milwaukee. Center for Great

Lakes Studies.
For primary bibliographic entry see Field 5C. W74-04786

THE TRANSPORT OF ORGANIC CARBON TO ORGANISMS LIVING IN THE DEEP OCEANS, Dalhousie Univ.. Halifax (Nova Scotia). Inst. of Oceanography.
For primary bibliographic entry see Field 5C.
W74-04790

A REPORT ON THE LIMNOLOGY OF MON-

ROE RESERVOIR, INDIANA, Indiana Univ., Bloomington. School of Public and Environmental Affairs.
For primary bibliographic entry see Field 2H.

W74-04792

AGRICULTURAL WATERSHED IN PENNSYL-VANIA, Agricultural Research Service, University Park,

Pa. Northeast Watershed Research Center. W. J. Gburek, and W. R. Heald. Water Resources Research, Vol 10, No 1, p 113-118, February 1974. 1 fig, 1 tab, 10 ref.

Descriptors: *Phosphates, *Water pollution sources, *Fertilizers, Leaching, Land use, *Pennsylvania, Path of pollutants, *Agricultural

watersheds. Identifiers: *Mahantango watershed(Penn).

Soluble phosphate data were collected from the stream draining a 7.7 sq km Pennsylvania agricultural watershed. The stream approaches constant and low phosphate concentrations of 10 ppb or less PO4-P during continuing base flow recession. Concentrations vary seasonally, 10 to 15 ppb PO4-P commonly occurring in the winter and 20 to 30 ppb occurring in the summer. Less than 2% of the P applied to the watershed as fertilizer is carried out of the watershed by the stream in the soluble form. Most of this output is associated with the high flows and low concentrations found in the early spring. The land adjacent to the stream channel and its indigenous vegetation can be a direct source of soluble phosphate to the stream during periods of precipitation. This makes the PO4-P levels observed at the watershed outlet the result of near- and in-stream processes and reduces the importance of general land use of a watershed as a determining factor in the soluble phosphate con-centrations in the stream. (Knapp-USGS) W74_04804

VERIFICATION OF WATER TEMPERATURE FORECASTS FOR DEEP, STRATIFIED RESER-

Oregon State Univ., Corvallis. School of Oceanography. or primary bibliographic entry see Field 4A. W74-04807

PROBLEM OF PURE WATER IN THE USA. (IN RUSSIAN).

Vsesoyuznyi Institut Nauchno-Tekhnicheskoi Informatsii po Selskomu Khozyaistvu, Moscow For primary bibliographic entry see Field 5G.

W74-04837

DISTRIBUTION OF ORGANIC MATTER AND BACTERIA IN THE UPPER LAYER OF BOT-TOM DEPOSIT OF LAKE BALATON.

Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
J. E. Ponyi, J. Olah, and A. Franko.

Ann Inst Biol (Tihany) Hung Acad Sci. 39: p 141-148. Illus. 1972. (Hungarian summary).

146. Inus. 1972. (Flungarian summary).
Identifiers: *Bacteria, Bottom deposits,
*Distribution, *Hungary(Lake Balaton), Nitrogen,
*Organic matter, Water pollution sources.

The upper layer of the bottom deposit in the open water of Lake Balaton (Hungary) is poor in or-ganic materials. The values obtained were 3-4% except for the Bay of Keszthely where values of 8-9% were registered. Noteworthy quantitative dif-ferences in the organic matter content between the different points of the individual transversal sections were found only in the Bay of Keszthely. Values of Kjeldahl-N content in the different areas of bottom are nearly identical (0.3-0.5%). Amounts of HCl-soluble materials in the Bay of Keszthely and its neighborhood are 46-51% and in the other areas of the lake over 60%, and proceed-ing from the southern shore northward the amounts increase in most of the transversal sections. Average bacterial counts and the amounts of the 3-5 micro fractions of particulate organic materials in the bottom are generally higher in the Bay of Keszthely and its neighborhood than in other areas of the lake. The quantitative distribution of bacteria and particulate organic materials along the transversal sections is heterogeneous.— Copyright 1973, Biological Abstracts, Inc. W74-04839

AN EXPERIMENT IN SANITARY-VIROLOGI-CAL RESEARCH ON SEWAGE, (IN RUSSIAN), A. P. Markov.

A. F. Markov.

Gig Sanit. 37(2): 94-95. 1972.

Identifiers: Agglutination, Centrifugation, Cultures, Embryo, Erythrocyte, Ether, Fibroblast, Penicillin, *Sanitary engineering, *Sewage, Streptomycin, Tampon, *Virological research, *Enteroviruses, Antibiotic treatment.

Wide distribution of enteroviruses in sewage was established. A study done from 1968-1970 isolated viruses from sewage obtained by the tampon method. After centifugation, part of the sample was treated with antibiotics (penicillin and strepto-mycin) and the rest with ether. Pathogenic agents were identified by hemagglutination with human erythrocytes, hemagglutination lag and neutraliza-tion with type-specific sera. Strains (40) of virus tion with type-specific sera. Strains (40) of virus were isolated from samples treated with antibiotics and 28 strains from samples treated with ether. In human embryo fibroblast cultures, 72 virus strains were isolated from samples treated with antibiotics and 38 strains from samples treated with either. Partial loss of viruses apparently occurs during antibiotic treatment.—Copyright 1973, Biological Abstracts, Inc. W74-04849

SALMONELLA SEROTYPES IN SEWAGE OF

VARIOUS ORIGINS, Nauchno-Issledovatelskii Institut Gigieny. Moscow (USSR).

G. P. Kalina, and V. L. Shiganova. Gig Sanit. 37(2): 104-106, 1972.

Identifiers: Animal, Birds, Cat, Cattle, Cold, Dog, *Epidemiology, Meat, Processing Rodent, *Salmonella serotypes, *Sewage, Strain, Swine, *Enterobacteria

Pathogenic enterobacteria were studied in waste fluids from 3 drains of a meat reprocessing plan (MRP), 2 of which contained manufacturing waste (MRF), 201 when contained manufacturing waste and I containing fecal material, and 2 aeration sta-tions (AS) containing fecal waste before and after sterilization. Strains of Salmonella (194) of various serotypes were isolated. In MRP sewage, groups E and CI (12 strains) predominated, in AS sewage, serogroup B predominated. Some group D Sal-

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Effects Of Pollution—Group 5C

monella were found in MRP samples. C2 was dismonella were found in MRP samples. C2 was dis-tributed almost evenly in both. Three types of Sal-monella are discussed: those associated with hu-mans, rodents, dogs, and cats, those associated with cattle, swine and domesticated birds, and those associated primarily with wild birds and cold blooded animals. Numerous examples are given.
The determination of Salmonella serotypes in variand determination of Samonella serotypes in various types of sewage is of epidemiological and sanitary importance.—Copyright 1973, Biological Abstracts, Inc.
W74-04850

5C. Effects Of Pollution

NUTRIENT INCOME CHANGE RELATED TO

PLANKTON ALGAE,
Washington Univ., Seattle. Dept. of Civil En-

gineering. E. B. Welch, R. M. Emery, C. E. Moon, and D. Spyridakis.

Completion Report, August 25, 1972. 39 p, 7 fig, 8 tab, 18 ref. OWRR A-045-WASH(1).

Descriptors: *Diversion Bescriptors: "Diversion, "Phosphorus, "Eutrophication, "Mesotrophy, Plankton, "Washington, Lakes, Lake sediments, Nutrients, "Phytoplankton, Productivity, Anaerobic condi-tions, Nitrogen, Iron. Identifiers: "Lake Sammamish(Wash).

Lake Sammamish, which lies about 12 miles east of Seattle, Washington, with moderate depth (mean 17.7m) and area (19.8 km sq.), can be classified mesotrophic. While diversion of over 1/2 the sified mesotrophic. While diversion of over 1/2 the phosphorus (P) from nearby Lake Washington during 1963-67 was followed by reduction in winter mean P content and a rapid shift from eutrophy to mesotrophy (Edmondson, 1970), mean winter P content and measured characteristics of plankton response have not changed significantly in Lake Sammamish following a diversion of similar magnitude. Annual nutrient budgets suggest a reduction in sedimented P since diversion but little change in the quantity of P diversion but little change in the quantity of P released from anaerobic sediment. P availability in released from anaerobic sediment. P availability in the water column (winter mean content) appears to be controlled by iron precipitation to a greater extent than in Lake Washington. Experiments in situ show that nitrogen and P are equally limiting to summer phytoplankton productivity, but as found in Lake Washington, P may be of more long term significance. Urban runoff is apparently not enriching the lake to a great extent and therefore has probably not retarded the recovery of the lake. W74-04318

ENVIRONMENTAL MONITORING AND DISPOSAL OF RADIOACTIVE WASTES FROM U.S. NAVAL NUCLEAR-POWERED SHIPS AND THEIR SUPPORT FACILITIES, 1972, Department of the Navy, Washington, D.C. For primary bibliographic entry see Field 5B. W74-04441

ECODISTRIBUTION OF PLUTONIUM IN LIQUID WASTE DISPOSAL AREAS AT LOS Los Alamos Scientific Lab., N. Mex.

For primary bibliographic entry see Field 5B.

ANNUAL CONSUMPTION OF CESIUM-137 AND COBALT-60 LABELED PINE SEEDS BY SMALL MAMMALS IN AN OAK-HICKORY

Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 5B. W74-04450

ENVIRONMENTAL SURVEILLANCE FOR FUEL FABRICATION PLANTS, Battelle Pacific Northwest Labs., Richland, Wash.

For primary bibliographic entry see Field 5B. W74-04451

VERTICAL DISTRIBUTION OF FISHES RELA-TIVE TO PHYSICAL, CHEMICAL AND BIOLOGICAL FEATURES IN TWO CENTRAL ARIZONA RESERVOIRS,

Arizona State Univ., Tempe P.O. Bersell.

Available from NTIS, Springfield, Va 22151 as COM-73-11333 Price \$5.75 printed copy; \$1.45 microfiche. M Sc Thesis, September 1973. 65 p, 9 fig, 10 tab, 33 ref.

Descriptors: *Reservoirs, *Arizona, *Fish popula-tions, Water pollution effects, Variability, Ecolo-gy, *Food chains, Seasonal, Aquatic populations, Ecosystems, Thermal stratification, Euphotic zone, Dissolved oxygen, Chlorophyll, Plankton, Water temperature

Distribution of fishes in two central Arizona reservoirs was studied by vertical gill netting, stressing intra- and inter-lake variability. Transects were established and sampling was performed three times a year in an attempt to examine variations times a year in an attempt to examine variations during ecological seasons. Data on fish distributions, other biotic factors, and selected physicochemical features were obtained. Multiple linear regression analysis was employed to determine which abiotic and biotic features were most important to vertical dispersion of fishes. Despite high variability and often small sample size, data suggested dissolved oxygen, chlorophyll-a, plankton, and to a far lesser extent temperature were ton, and to a far lesser extent, temperature, were important factors in fish dispersion patterns. Vertical light penetration (depth of the euphotic zone) seemed to act in a more subtle, indirect manner in seemed to act in a more subtle, indirect manner in its influence on fishes. Species interactions were noted and foodchain relationships seemed apparent in many instances. The majority of all fishes netted in the study (1970-71) were within the upper 10 m of the water column in both reservoirs. (Knapp-USGS) W74-04474

CONCERNING LARGE-SCALE CULTIVATION OF THERMOPHILIC COSMOPOLITAN
MASTIGOCLADUS LAMINOUSUS COHN
(CYANOPHYTA) IN ICELANDIC HOT ICELANDIC HON

Eidgenoessische Technische Hochschule, Zurich (Switzerland). Institut fuer Molekularbiologie und

For primary bibliographic entry see Field 2I. W74-04486

RELATIVE SUSCEPTIBILITY OF LAKES TO WATER-QUALITY DEGRADATION IN THE SOUTHERN HOOD CANAL AREA, WASHING-

Geological Survey, Tacoma, Wash. For primary bibliographic entry see Field 5B. W74-04488

ESTIMATING THE BENEFITS OF STREAM VALLEY AND OPEN SPACE PRESERVATION PROJECTS,

Regional Science Research Inst., Philadelphia, Pa. For primary bibliographic entry see Field 6B. W74-04500

EFFECTS OF CONDENSATES ON THE TOXICITY OF KRAFT PULP MILL EFFLUENTS, B.C. Research Ltd., Vancouver. For primary bibliographic entry see Field 5D. W74-04521

BIOCHEMICAL ECOLOGY OF WATER POL-Ohio State Univ., Columbus. Dept. of Microbiolo-

P. R. Dugan.

Plenum Press, New York, N.Y. (and London, England), 1972. 159 p, 37 fig, 17 tab, 144 ref. Price: \$14.50.

Descriptors: *Water pollution effects, *Aquatic life, *Water properties, *Ecology, *Pollutants, Toxicity, Water pollution, Water pollution sources, Organic loading, Organic compounds, Nutrients, Eutrophication, Lakes, Water types, Biodegradation, Biochemistry, Water chemistry, Pesticides, Detergents, Carbohydrates, Proteins, Amino acids, Lipids, Lignins, Water resources, Water supply, Hydrologic cycle, Inorganic compounds, Radioactive wastes, Thermal pollution, Mine drainage.

Information is presented on biological and biochemical reactions important to the un-derstanding of water pollution and its effects on organisms at the cellular and molecular levels. The 12 chapters deal with the following topics: Significance of water pollution; Causes and types of pollutants (inorganic, organic, toxic, radioactive, pathogenic, thermal, etc.); Water availability and use (hydrological cycle, first- and second-order pollution); Biochemical aspects of pollution; Ecological concepts such as symbiosis; Chemical, Ecological concepts such as symbiosis; Chemical, physical, and biological characteristics of water; Degradation of organic pollutants (hydrolytic, oxidative, and dissimilative reactions of polysaccharides, proteins, fats, amino acids, etc.); Recalcitrant molecules (ENVIRONMENTAL PROTECTION FACILITIES AT THE RECENTLY EXPANDED PULP AND PAPER MILL OF Continents Can Co. in Hedre 1.5 is MILL OF Continental Can Co. in Hodge, La., is an effluent decoloring system, in which lime is added to the waste waters entering the first clarifire stage. Sludge from this primary clarifier, includ-ing precipitated color bodies, is incinerated in the mill's lime kiln for recovery of lime. Dissolved s lime kiln for recovery of lime. Dissolved lime remaining in the clarified effluent is recovered by treatment with lime kiln stack gases which provide the carbon dioxide needed to precipitate dissolved lime as Ca carbonate. The pH of the clarifier effluent is adjusted before it enters the oxidation ponds for secondary treatment. Air pollution abatement facilities at the mill are also described. (Witt-IPC) W74-04523

A PRELIMINARY SURVEY OF THE POSSIBLE CONTAMINATION OF LAKE NAKURU IN KENYA WITH SOME METALS AND CHLORINATED HYDROCARBON PESTI-

CIDES, Utrecht Riiksuniversiteit (Netherlands). Inst. of Veterinary Pharmacology and Biological Tox-

icology. J. H. Koeman, J. H. Pennings, J. M. De Goeij, P.

J. H. Koeman, J. H. Pennings, J. M. De Goeij, P. S. Tjioe, and P. M. Olindo.
J Appl Ecol. Vol 9, No 2, p 411-416, 1972, Illus. Identifiers: Birds, "Chlorinated hydrocarbon pesticides, "Copper, Fish, "Kenya(Lake Nakuru), Lakes, Metals, Pesticides, Survey, Toxicity, *Zinc, Soda-lakes.

In the period of sampling, chlorinated hydrocar bon pesticides and 6 selected metals probably did not represent a hazard to the fish and birds in Lake Nakuru. With respect to Zn and Cu a more detailed study will be required to measure the toxicity of these elements alone and in combination under the peculiar environmental conditins of this soda-lake. This type of information will be needed for the evaluation of tolerance limits with regard to pollution problems which may arise in the future. These data should provide useful baseline information for monitoring future trends of pollution in this part of the world.--Copyright 1973, Biological Abstracts, Inc. W74-04547

QUALITY REQUIREMENTS OF AQUATIC INSECTS, Utah Univ., Salt Lake City. Dept. of Botany. A. R. Gaufin.

Group 5C-Effects Of Pollution

Available from GPO Sup Doc Copy Available from GPO Sup Doc as EP1.23:660/3-73a004, \$1.20; microfiche from NTIS as PB-228 582, \$1.45. Environmental Protection Agency Ecological Research Series Report, EPA-660/3-73-004, September 1973. 89 p, 3 fig, 15 tab, 50 ref. EPA Project 18050 FLS.

Descriptors: Water pollution effects, Water quality, *Aquatic insects, *Thermal pollution, *Dissolved oxygen, *Hydrogen ion concentration, Diptera, Mayflies, Stoneflies, Mayflies, Caddis-

flies, Water temperature. Identifiers: Pollution evaluation, Water quality criteria, Receiving waters, *Water quality requirements, Trichoptera.

The larvae of twenty species of aquatic insects (Diptera, Ephemeroptera, Plecoptera, and Trichoptera) and the scud (Amphipoda) were exposed to high water temperatures, low dissolved oxygen concentrations, and low pH to determine their tolerance of these three environmental factors. The temperature at which 50% of the specimens died after 96 hours exposure ranged from 11.7C for the mayfly. Cinygmula par Eaton, to 32.6C for the snipe fly, Atherix variegata Walker. The mayfly, Ephemerella doddsi Needham, was most sensitive to low dissolved oxygen levels with a 96-hour TLm of 5.2 mg/1. Acroneuria pacifica Banks, a stonefly, was the most resistant with a TLm 96 of 1.6 mg/l. Median tolerance levels for pH ranged from pH 2.7 for the caddis fly, Limnephilus ornatus Banks, to 7.2 for the scud, Gammarus limaeus Smith. Longer term bioassays clearly indicated increased sensitivity and mortality of the test specimens with increased length of exposure to each of these factors. To maintain a well-rounded diversified population of cold water aquatic insects, maximum temperatures, minimum dissolved oxygen levels, and the pH range should not exceed the requirements of cold water fishes, such as trout and salmon. While some aquatic insects can tolerate dissolved oxygen levels as low as 1.6 mg/1 for short periods, concentrations of 6.0 mg/1 are required for long-term survival. Temperatures during the winter months must be maintained at normal seasonal levels to prevent premature emergence. Temperatures above 65F during the summer months are considered the maximum for maintaining many spe cies of stoneflies, mayflies, and caddis flies. A pH range of 6.0-8.5 should protect most cold water lotic insects. (EPA) W74-04551

EFFECT OF PHOSPHORUS PROCESSES ON ALGAL GROWTH, California Univ., Irvine. REMOVAL

J. Scherfig, P. S. Dixon, R. Appleman, and C. A. Justice.

Available from GPO Sup Doc Copy Available from GPO Sup Doc as EP1.23:660/3-73-015, \$1.20; microfiche from NTIS as PB-228 585. Environmental Protection Agency Ecological Research Series Report EPA-660/3-73-015, September 1973, 81 p, 13 fig, 41 tab, 11 ref. EPA Project 16010 GJH.

Descriptors: *Bioassay, *Algal control, Assay, Tertiary treatment, Eutrophication, Water reclamation, Nutrients, Phosphorus, Waste water treatment, Sewage treatment, California, Water pollution effects

Identifiers: *Phosphorus removal, *Algal assay procedures, Growth limiting nutrients, Algae growth control, Batch algal assays, Continuous culture assays, Santee(Calif).

Laboratory studies were conducted to improve algal assay techniques for use in evaluation of sewage treatment processes. Laboratory studies (batch and continuous cultures) were conducted at the Santee California water reclamation plant to evalute the effect of tertiary waste treatment processes on the amount of algal growth in the treated effluent. Laboratory studies were also conducted to determine the growth limiting nutrients in each type of tertiary effluent. Field tests were

conducted using special study ponds and the results of the field tests were compared with the laboratory test results. The laboratory and field tests showed the same relative ranking for the treated effluents. (EPA) W74-04552

THE EFFECTS OF METHOXYCHLOR ON AQUATIC BIOTA, Michigan Dept. of Natural Resources, Ann Arbor. Inst. for Fishery Research. J. W. Merna, and P. J. Eisele. Copy Available from GPO Sup Doc as EPI.23:73-009 (2016)

\$0.95; microfiche from NTIS as PB-228 643 \$1.45. Environmental Protection Agency Ecological Research Series Report EPA-R3-73-046, September 1973. 59 p, 13 fig, 22 tab, 22 ref. EPA Project 18050 DLO.

Descriptors: *Pesticide toxicity, Pesticides, *Bioassay, Lethal limit, Biota, *Fish reproduction, *Yellow perch, Minnows, Water pollution ef-

Identifiers: Phytotoxicity, Fish toxicity, Fathead minnows, TL-50, *Fathead minnows, Gammarus pseudolimnaeus, Orconectes virilis, *Methoxychlor.

Continuous-flow bioassays yielded 96-hour TL50 values for invertebrates ranging from 0.61 microgram/1 for Gammarus pseudolimnaeus to 7.05 microgram/1 for Orconectes virilis. Fathead minmicrogram/1 for Orconectes virius. Fatnead min-nows (Pimephales promelas) and yellow perch (Perca flavescens) had 96-hour TL50 values of 8.63 and 22.2 micrograms/1 respectively. Hatching of fathead minnow eggs was inhibited at all levels of exposure tested between 1.0 and 0.125 microgram/1. There was no spawning at 2 microgram/1. Growth of yellow perch was retarded at all levels tested between 5.0 and 0.625 micrograms/1. All perch died at 10 micrograms/1 during the growth study. Perch which had been subjected to long-term exposure to 5 microgram/1 of methoxychlor had an abnormally high oxygen demand when held in a respirometer with a water velocity of 0.6 foot per second. (EPA) W74-04553

THE ANALYSIS OF ARSENIC IN THE LIPID PHASE FROM MARINE AND LIMNETIC ALGAE,

Inst. for Industrial Research, Oslo For primary bibliographic entry see Field 5A. W74-04557

ECOLOGICAL INVESTIGATIONS OF PONDS WITH SPECIAL REGARD TO THE CON-SEQUENCES OF WATER POLLUTION BY OIL,

Kiel Univ. (West Germany). Zoologisches Institut.

Arch Hydrobiol. Vol 70, No 4, p 442-483. 1972,

Illus. (English summary).

Identifiers: *Aquatic insects, Ecological studies, *Germany, *Mussels, *Oil pollution, Ponds, *Snails, Water pollution effects.

The occurrence of most species in 13 ponds in NW-Germany did not depend on the type or on the site of the pond. Only a few of the species preferred either wood-ponds or ponds in the open cultivated areas. Ponds refilled with water after desiccation were immediately recolonized by species that had survived in the bottom. Other sp cies that had survived in the bottom. Other species immigrated by flight or by crawling from their hid-ing places in a regular sequence. When the water surface was polluted by thin layers of motor oil many of the aquatic insects were killed. The dangerous effects of the oil decreased rapidly within a few days. Snails and mussels fed on oil and even reproduced later on. The fauna which did not come into direct contact with the film of oil was endangered by oil only above a high concent tion.--Copyright 1973, Biological Abstract, Inc. W74-04635

THE RELATION BETWEEN PHYTOPLANK-TON AND PHOSPHATE IN THE LAKE OF CONSTANCE, (IN GERMAN), Staatliches Institut fuer Seenforschung und Seen-bewirtschaftung, Konstanz (West Germany). Ab-teilung Max Auerbach-Institut. H. Lehn.

Arch Hydrobiol. Vol 70, No 4, p 556-559. 1972,

Illus, (English summary).
Identifiers: *Germany(Lake of Constance),
Lakes, *Phosphates, *Phytoplankton, Phosphorus.

Since 1920 two criteria of water quality, the Since 1920 two criters of water quanty, the phosphate-phosphory-concentration during winter circulation and the phytoplankton density, have increased greatly. In the half-logarithmic system of coordinates a straight line runs through the relative points, and this is higher in the shallow une renauve points, and this is higher in the shallow Gnadensee than in the deep Obersee. With in-creasing phosphate concentration the efficiency of phytoplankton production in both basins of the lake decreases logarithmically.—Copyright 1973, Biological Abstracts, Inc. W74-04637

ECOLOGICAL CHARACTERISTICS OF GO-

Tokyo Univ. (Japan). Ocean Research Inst. H. Seki, M. Takahashi, Y. Yamaguch, and S.

Arch Hydrobiol. Vol 70, No 4, p 425-441, 1972,

Identifiers: *Algal ooze, Ecological studies, *Japan(Go-No-Ike Lake), Lakes, *Eutrophication, *Productivity.

The ecological characteristics of an eutrophic lake, Go-no-ike Lake, Japan, were investigated with special references to its high biological productivity and to the significance of the algal ooze in the ecological system in the lake.—Copy-right 1973, Biological Abstracts, Inc.

EFFECTS OF TOXICANTS ON BRACKISH-WATER PHYTOPLANKTON ASSIMILATION, Institute of Marine Research, Helsinki (Finland).

Biology Div. A. Niemi.

A. Niemi.
Comment Biol Soc Sci Fenn. 55. p 1-19. 1972. Illus.
Identifiers: Brackish water, *Copper ions,
*Cyanides, *Phenols, *Phytoplankton, Potassium
cyanide, *Sulfates, Toxicants, Water pollution effects *Finland

The acute effect of CuSO4, pure phenol and KCN on the assimilation rate and dark fixation of vernal, early summer and late summer phytoplankton communities was studied in situ at Tvarminne Zoological Station, south coast of Finland. Low concentrations of all the 3 chemicals had a stimulating effect. At a certain concentration of each lating effect. At a certain concentration of each chemical, an inhibitory effect became apparent in both assimilation and dark fixation tests. At higher concentrations the inhibitory effect was total in the assimilation, but the dark fixation values did not decrease to zero. There was no clear difference in the susceptibility of vernal, early summer and late summer phytoplankton communities to the toxicants, except that the vernal phytoplankton community seemed to be less susceptible to ionic Cu than the other communities. This may depend on differences in the species ties. This may depend on differences in the species composition between the vernal and summer communities.—Copyright 1973, Biological Abstracts, W74_04644

CALCULATION OF THE CONCENTRATION OF THE BIOMASS OF BLUE-GREEN ALGAE DURING SETTLING, (IN RUSSIAN), Ukrainskii Nauchno-lssledovatelskii Institut

Ukrainskii Nauchno-Issledovateiskii Gidrotekhniki i Melioratsii, Kiev (USSR).

Gidrobiol Zh. Vol 8, No 5, p 127-132. 1972. Illus.

Identifiers: *Algae, *Biomass, Calculations, Reservoirs, Settling, *Cyanophyta, Reservoirs, Settling, *Eutrophication, *Bioassay.

In connection with the problem of water bloom in reservoirs due to the massive reproduction of blue-green algae, the problem of removing the algae from the water and concentrating them is discussed. One of the ways of obtaining the algal discussed. One of the ways of obtaining the algai biomass consists in collecting the concentrated masses at 'bloom spots' by floating pump plants which are equipped with suction devices that gather and pump only the upper water layer most saturated with algae. Formulas are given for deter-mining the rate of settling of the water-alga mix-ture, during which the algae usually floats, form-ing the surface of the actificients. ing on the surface of the settling tank a more con-centrated biomass layer.—Copyright 1973, Biological Abstracts, Inc. W74-04645

LITTORAL VEGETATION OVERGROWING IN SOME LAKES OF KALININ DISTRICT, (IN RUSSINA),

Nauk SSSR. Moscow. Institut Geografii.

For primary bibliographic entry see Field 2H.

PHYTOPLANKTON DYNAMICS IN THE SEVERSKIY DONETS RIVER FOR THE FIRST YEARS AFTER ITS REGULATION, (IN RUS-SINA).

Kharkov State Univ. (USSR).

R. P. Zhupanenko. Gidrobiol Zh. Vol 8, No 5, p 28-35, 1972. (English

Identifiers: Autumn. *Bacillariophyta, *Chrysophyta, *Phytoplankton, *Cyanophyta, Regulation, Rivers, Seasons, -Donets River), Summer, *USSR(Severskiy-Donets Biomass. Reservoirs.

The phytoplankton study in the Severskiy Donets River (USSR) above and below the dam, and the weir pool of the Pechenezhskoye Reservoir showed that in the winter through spring period, the basic part of the number and biomass of the phytoplankton below the dam and in the weir pool is formed by Bacillariophyta and Chrysophyta and in the surges and surper by Carachbert Lludge. in the summer and autumn by Cyanophyta. Under the effect of Pechenezhskoye Reservoir, the number and biomass of the phytoplankton below the dam is increasing, together with decrease in the number of species.—Copyright 1973, Biological Abstracts, Inc. W74-04648

TEMPERATURE ACCLIMATION IN THE MEDUSA, CHRYSAORA QUINQUECIRRHA, Georgetown Univ., Washington, D.C. Dept. of Biology. R. S. Blanquet.

Comparative Biochemistry and Physiology, Vol 43B, No 3B, p 717-723, 1972. 3 fig, 19 ref.

Descriptors: Adaptation, *Aquatic animals, *Enzymes, *Metabolism, *Temperature, Biochemistry, Physiology, Reproduction, Environmental effects, Thermal pollution, Laboratory studies, *Chesapeake Bay, Water pollution effects. Identifiers: *Medusa.

The levels of the two enzymes, Glucose-6-phosphate dehydrogenase and 6-phosphogluconic acid dehydrogenase, were chosen as indices for this investigation of the Chidarian thermal acclimation of this medusa species. Chrysaora polyps possessing G6PDH and 6PGDH were acclimated to cold and warm water and the enzyme activity was assayed. G6PDH activity was observed but there was little or no 6PGDH activity. Cold accli-mated animals demonstrated a dramatic rise in G6PDH specific activity at all substrate concentrations and temperatures tested. This increase was accompanied by a reduced Michaelis constant and energy of activation. A temperature dependent change occurred at about 10C in both groups so that specific activity was greater at that tempera-ture than at 15C. This was more pronounced in the cold acclimated animals. It is suggested that the data are of adaptive significance with respect to pedal cyst formation at low ambient temperatures. (Jerome-Vanderbilt) W74-04660

THERMAL RESPONSES IN CIRRHINA MRIGALA FRY, Bhabha Atomic Research Centre, Bombay (India).

Health Physics Div.

Heatth Physics Div.
M. C. Balani, and R. Viswanathan.
Current Science, Vol 42, No 6, p 192-194, March
20, 1973. 4 fig, 2 tab, 7 ref.

Descriptors: *Carp, *Temperature, *Fish behavior, *Mortality, Aquatic environment, Aquatic animals, Toxicity, Indicators, Laboratory tests, Evaluation, Heat, Physiology, Pathology, Thermal pollution, *Thermal stress.

Temperature plays a dominant role in regulating growth, reproduction, and other aspects of physiology in aquatic species. Studies of the reacphysiology in aquatic organisms to temperature shifts are of particular significance to commercial fishe-ries. The opercular movement is a conventional indicator of fish response to thermal stress, but the temperature of loss of equilibrium is now con-sidered to be a more effective death point indicasidered to be a more effective death point indica-tor. Results of responses of carp fry exposed to conditions of thermal stress and shock are presented. Elevated water temperatures ranged from 30 to 39C. The median lethal temperature was 37.8C. Significant differences in thermal responses were observed between fry and fingerlings. A high rate of mortality was observed when fry were returned to non-lethal temperatures after being exposed to thermal shock at 38.0 and 39.2C. (Jerome-Vanderbilt)

EFFECTS OF TEMPERATURE ON DEVELOP-ING MERISTIC STRUCTURES OF SMALL-MOUTH BASS, MICROPTERUS DOLOMIEUI LACEPEDE,

Pan American Univ., Edinburg, Tex. Dept. of Biology. C. R. Wallace.

Transactions of the American Fisheries Society, Vol 102, No 1, p 142-145, 1973. 3 fig, 1 tab.

Descriptors: *Bass, *Temperature, *Growth rates, *Fish physiology, Environmental effects, Aquatic environment, Fish, Cytological studies, Inhibitors, Mortality, Laboratory tests, Measurements, Evaluation, Water temperature, Water pollution

effects.
Identifiers: *Meristic structures.

Environmental temperatures affect the number of meristic structures in some fish. Generally, highest meristic structure counts in fishes are associated with lower temperatures and longer development and the lowest counts are associated with higher temperatures and rapid development. Studies were conducted to determine the effects of temperature on the numbers of lateral line scales, right and left pectoral fin rays, dorsal fin soft rays and spines, and anal fin soft rays and spines of laboratory raised smallmouth bass. Eggs were collected, divided into 5 groups and placed in constant temperature tanks set at 17, 20, 23, 26 and 29C. All smallmouth bass were raised to approximately 40-75 mm in total length, killed and subjected to meristic counts. Definite relationships were found between temperature and mean numbers of lateral line scales, anal spines and dorsal soft fin rays; while right and left pectoral fin rays, dorsal spines and anal soft fin rays were not significantly dif-ferent. Mean numbers of lateral line scales for the

five temperature lots yielded a sigmoid curve, higher at 20 and 29C than at 17, 23 and 26C. Mortality was the highest at 17C (84.3%) and 29C (95.4%). The lowest mortality occurred at 23C (35.1%). (Jerome-Vanderbilt)

THE PREFERRED TEMPERATURE OF FISH AND THEIR MIDSUMMER DISTRIBUTION IN EMPERATE LAKES AND STREAMS,

Department of Lands and Forests, Maple (Ontario). Research Branch. R. G. Ferguson.

R. G. Perguson.

Journal of the Fisheries Research Board of Canada, Vol 15, No 4, p 607-624, 1958. 7 fig, 3 tab,

Descriptors: *Fish, *Yellow perch, *Water temperature, *Distribution patterns, Aquatic environment, Aquatic animals, Fish behavior, Temperature, Laboratory tests, On-site data collections, Heated water, Lakes, Canada, Wisconsin, Tennessee, Trout, New York, Bioassay, Seasonal, Statistical methods, Perches. Identifiers: *Thermal preference.

Laboratory studies of preferred temperature with yellow perch are compared with 21 other species. These show that temperature, if acting alone, can determine the distribution of fish. Factors such as light, conditioned responses related to feeding, and social behavior interfere with the expression and social behavior interfere with the expression of the response to temperature. The level of thermal acclimation influences the range of temperature preferred. In general the preferred temperature is considerably higher than the acclimation temperature at low thermal acclimations but the difference decreases up to the final preferendum where both coincide. Summer field observations of yellow perch in three lakes in Ontario showed average thermal distribution of 19.7, 21.0, and 21.2C. These temperatures agree well with data from 4 Wisconsin lakes. Oxygen depletion, distribution of primary prey species and other factors are shown to modify the thermal distribution in nature. The agreement between laboratory studies performed with older fish and the field observations was excellent. (Jerome-Vanderbilt)

HEAT - A GROWING WATER POLLUTION PROBLEM,

bibliographic entry see Field 5B.

TEMPERATURE REQUIREMENTS FOR EMB-TEMPERATURE REQUIREMENTS FOR SALES FOR A SALES FOR THE NORTHERN PIKE, ESOX LUCIUS (LINNAEUS), National Water Quality Lab., Duluth, Minn. K. E. F. Hokanson, J. H. McCormick, and B. R.

Jones. Transactions of the American Fisheries Society, Vol 102, No 1, p 89-100, 1973. 5 fig, 5 tab, 25 ref.

*Aquatic *Growth rates. *Embryonic Temperature. *Temperature, *Growth rates, *Embryonic growth stage, *Pikes, Aquatic animals, Fish, Environmental effects, Mortality, Growth stages, Larval growth stage, Metabolism, Biomass, Laboratory tests, Bioassay, Evaluation, Water pollution effects.

Identifiers: *Northern pike, Tolerance limits, Heat

Several bioassay methods, responses and end points were evaluated for use in determining the temperature requirements of northern pike embryos. Emphasis was placed on evaluating the relative effects of temperature on embryo survival by correcting for differences in fertilization success among experiments. The most variable end point among experiments was the optimum temperature; while the most reproducible end point was the median tolerance limit (TL50). The lower and upper TL50's were 6.9 and 19.2C for normal hatch

Group 5C-Effects Of Pollution

and 6.3 and 19.9C for total hach. The age of the embryo at the time of exposure had a great effect on these tolerance limits. The 1-day upper TL50 for newly hatched and swimming yolk-sac larvae was 28.4C when acclimated to 17.7C. Both larvae stages survived a lower limit of 3.2C for 7 days. Newly hatched yolk-sac larvae were more sensi tive than swimming yolk-sac larvae to 7-day exposures to high temperatures. Growth of larvae was maximum at 26C and negligible below 7C. The high larval growth at 26C was offset by an increased mortality rate during the first 2 weeks of life. Net biomass change was highest at 21C. (Jerome-Vanderbilt) W74-04670

EFFECT OF LIGHT ON VULNERABILITY OF

HEAT-STRESSED SOCKEYE SALMON TO PREDATION BY COHO SALMON, Virgin Islands Dept. of Conservation and Cultural Affairs, Charlotte Amalie, St. Thomas.

J. R. Sylvester. Transactions of the American Fisheries Society, Vol 102, No 1, p 139-142, 1973. 1 fig. 1 tab, 8 ref.

Descriptors: *Fish behavior, *Salmon, Swimming, *Predation, *Light, Aquatic environment, Pink salmon, Chum salmon, Sockeye salmon, Temperature, Environmental effects, Fish migration, Stress, Mortality, Laboratory tests, Water temperature, Statistical analysis, Water pollution

Identifiers: *Heat stress.

Light has been shown to affect the migratory behavior of pink, chum and sockeye salmon. Migration during darkness is assumed to be an anti-predator trait. The effect of darkness on untreated and heat-treated sockeye salmon in avoiding coho salmon was investigated. Ten tests were conducted under each of the following conditions; (1) under light with the prey receiving no heat dose; (2) under darkness with the prey receiving no heat dose; (3) under light with the prey receiving a heat dose; and (4) under darkness with the prey receiving a heat dose. Darkness greatly inprey receiving a neat dose. Darkness greatly in-creased survival in prey which both received and did not receive a heat dose. There was a greater proportionate increase in prey survival between light and darkness with no dosage, than between light and darkness with a dosage. A significant in-teraction was found between light and dose conditions. The coho salmon predators seemed to be aided in locating their prey at night by the erratic swimming of heat-stressed sockeye salmon. (Jerome-Vanderbilt) W74-04671

RELATION BETWEEN THE AMOUNT OF NET ZOOPLANKTON AND THE DEPTH OF STATION IN SHALLOW LIPNO RESERVOIR, Ceskoslovenska Akademie

Hydrobiologicka Lab. Z. Brandl.

Hydrobiol Stud. 3 p, 7-51. 1973. Illus.

Identifiers: *Czechoslovakia(Lipino reservoir), Depth, *Phytoplankton, *Primary production, Reservoirs, Standing crop, *Zoo plankton.

The amount of net zooplankton in stations with varying depths, the primary production of phytoplankton and some chemical and physical properties of water were studied for serveral years in the shallow Lipinreagent permits analysis of high-molecular PEPA in the presence of low-molecular PEPA. Total high-molecular ethyleneamines and low-molecular amines can be colorimetrically using pnitrodiazobenzene. PEPA can be analyzed in the presence of PEI using the known colorimetric reaction for secondary amines with 1,2-naphthoquinone-4-sodium sulfonate. The sensitivity is high (0,02 mg/l.).—Copyright 1973, Biological Abstracts, Inc. A FIND OF MARSH SANDPIPER TRINGA STAGNATILIS IN THE NETHERLANDS, Amsterdam Univ. (Netherlands). Inst. of Tax-

onomic Zoology.
E. R. Osieck, and C. S. Roselaar.
Limosa. Vol 45, No 3/4, p 135-138. 1972. (English

*Clostridium-botulinum, Gallinago, *Marsh sandpiper, Molting Mortality, *Netherlands, Poisoning, Shelduck, Snipe, Tador-na-tadorna, Teal, Tringa-stagnatilis, *Bacterium, *Waterfowl. Identifiers: Anas-crecca, Anas-strepera, Avocet,

During the hot summer of 1971 the circumstances in the shallow waters of the Dutch new polder Zuidelijk Flevoland were appropriate for the development of the bacterium Clostridium botu-linum, type C. The toxin of this bacterium causes food poisoning, botulism, in waterfowl. Thousands of birds were found dead or dying, most of them teal Anas crecca, but also numbers most of them teal Anas creeces, but also numbers of snipe Gallinago, shelduck Tadorna tadorna, gadwall Anas strepera, and avocets Recurvirostra avosetta. Among these birds a marsh sandpiper Tringa stagnatis was found. It is the first such bird collected in the Netherlands and was placed in the collection of the Zoological Museum in Amsterdam. According to plumage and gonads it was a first calendar year bird, molting into winter plumage. The last few years this species has been seen almost once a year in the Netherlands, the first one being observed in 1958.--Copyright 1973, Biological Abstracts, Inc. W74-04681

CHEMICAL ECOLOGY: EVIDENCE FOR PHOSPHATE AS THE ONLY FACTOR LIMIT-ING ALGAL GROWTH IN LAKE KINNERET, Weizmann Inst. of Science, Rehovoth (Israel).

Isotope Dept. M. Halmann.

M. Haimann. Isr J Chem. Vol 10, No 4, p 841-855. Illus. 1972. Identifiers: *Algal growth, Chemical ecology, Growth rates, *Israel(Lake Kinneret), Lakes, *Nitrates, *Phosphates, Nutrients.

Experiments on the growth of the natural popula-tions of algae and of other microorganisms as a function of the supply of various nutrients was carried out for Lake Kinneret (Israel) water sampled at about 2 wk intervals during Jan-June 1972. The addition of orthophosphate caused a rapid rise in biomass, which, after several days, increased to 2-5 times that in untreated water, as measured by the increase in turbidity and protein content. The addition of NaNO3 or KNO3, NH4Cl, ferrous ethylenediamine sulfate, sodium silicate or vitamin B12 had no noticeable effect. The plot of biomass versus the concentration of phosphate is a steeply rising function in the range of 0.1 to 1.0 microgram molar orthophosphate, which levels off at higher phosphate concentrations, reaching saturation above about 2 microgram molar phosphate. Thus, in the range of its natural concentration in Lake Kinneret, 0.09-0.5 microgram molar, orthophosphate is the limiting factor. At about 2 microgram molar phosphate, nitrate becomes the limiting factor, as was shown by experiments in which both phosphate (> 2 microgram molar) and nitrate were added, resulting in extremely abundant algal growth. A model of the reduction of nutrient input was achieved by laboratory experi-ments, in which the lake water was diluted with distilled water (by 1/4), thus resulting in an approx-imately proportional (to about 1/4) decrease in biomass. The effect of restoring the natural con-centration of either nitrate or orthophosphate was then measured. Added nitrate had no effect, while added phosphate caused a rapid increase in biomass, which after 2-4 wk came close to that in the natural lake water. These results indicate that during the spring of 1972, P has been the only element limiting algal growth in the lake.—Copyright 1973, Biological Abstracts, Inc. DEATH OF THE MARSHES IN THE ARDENNES,
For primary bibliographic entry see Field 4A.

A POSSIBLE EXPLANATION FOR THE DIF-FERENCES IN THE FATTY ACID COMPOSI-TION OF FRESH-WATER AND MARINE TION OF FRESH-WATER AND MARINE FISHES, Magyar Tudomanyos Akademia, Tihany. Biologi-

cal Research Inst.

Ann Inst Biol (Tihany) Hung Acad Sci. 38: p 143-152, 1971, Illus.

102, 1971, Inus.
102, 1971, Inus.
104, Identifiers: *Algae, Crustacea, Diatoms, *Fatty-Acids, Fishes, Water pollution effects, *Cyanophyta, *Chlorophyta, Plankton.

The differences in the levels of linoleic and linolenic acids can be traced to the differences in species composition of phytoplankton in seas and inland waters. In marine phytoplankton the diatoms with low level of linoleic and linolenic acids predominate. In fresh-water bodies, however, the green and blue-green algae with high levels of both fatty acids prevail. The distribution of these fatty acids in the fats of herbivorous planktonic crustaceans shows the same pattern as in their food. Although both marine and freshwater fishes were able to desaturate and change linoleic and linolenic acids to long chain polyun-saturated fatty acids, the bulk of these fatty acids originates in lower trophic levels. Some planktonic crustacean species are able to regulate the levels of these fatty acids in their phospholipids according to the environmental temperature. Decrease in the environmental temperature results in an in-crease of eicosa-, and docosapolyenoic fatty acids in both fresh-water and marine crustaceans. The distrubution of long chain polyunsaturated fatty acids in the triglycerides of marine and fresh-water fishes is similar to that in their natural food. Planktonic crustaceans and fishes can dehydrogenate tonic crustaceans and inside can denydrogenate saturated fatty acids of both endogenous and exogenous origin. This process may modify the ratio of saturated to monounsaturated fatty acids in higher trophic levels as compared to the phytoplankton.—Copyright 1973, Biological Abstracts, Inc. W74-04688

MORPHOLOGICAL VARIATION MORPHOLOGICAL VARIATION OF KERATELLA COCHLEARIS (GOSSE) (ROTATORIA) IN SEVERAL MASURIAN LAKES OF DIFFERENT TROPHIC LEVEL, Polish Academy of Sciences, Warsaw. Inst. of

Ecology.
A. Hillbricht-Ilkowska.
Pol Arch Hydrobiol. Vol 19, No 3, p 253-264. 1972.

Identifiers: *Keratella-cochlearis. Morphological studies, Phytoplankton, *Poland(Lake Mikolajskie), *Rotatoria, Seston, Trophic levels, *Eutrophication.

The occurrence of K. cochlearis f. tecta in several The occurrence of K. cochleans I. tecta in several water bodies, differing morphologically and trophically, was analyzed, and the occurrence of this form and morphological variation of individual K. cochlearis in the eutrophic Lake Mikolajskie was examined in detail. This species occurs chiefly in the epilimnion, more abundantly and persistently in deeper lakes in comparison to shallower ones, whereas within morphologically similar lakes, it is more numerous in fertile ones. The average size of individuals of K. cochlearis occurring in Lake Mikolajskie is smaller in Aug. than in June, at similar thermal conditions, but different the label of the conditions of ferent phytoplankton abundance, and attains its maximum in Aug. (biomass about 15 mg/l). The size of individuals of K. cochlearis, including tecta forms occurring in the epilimnion is smaller by 20-25% than that of individuals found in the met nion and hypolimnion. The differentiation of in-dividuals is maintained during the whole summer season (comparison was made of results from midJune and mid-Aug.) and during the 24 hr cycle.— Copyright 1973, Biological Abstracts, Inc. W74-04696

PRINCIPLES OF EVALUATING EFFECTS OF TRINCIPLES OF EVALUATING EFFECTS OF THERMAL DISCHARGES ON SURFACE WATERS (GRUNDLAGEN FUR DIE BEUR-TEILUNG DER WARMEBELASTUNGEN VON GEWASSERN).

Landerarbeitsgemeinschaft Wasser, Mainz (West Germany).

Warmebelastund der Gewasser' Druckwerkstatten Koehler and Hennemann, Wiesbaden, Germany, October 1971, 84 p, 30 fig, 4 tab, append.

Descriptors: *Thermal pollution, *Heat budget, *Surface waters, Europe, *Water pollution effects, Forecasting, Water temperature, Tempera-Tects, Forecasting, Water temperature, Tempera-ture, Evaporation, Heated water, Seasonal, Meteorology, Rivers, Mixing, Dissolved oxygen, Water quality, Aquatic life, Water chemistry, Estuaries, Wastes, Thermal powerplants, Conden-sers, Cooling, Air temperature. Identifiers: *Germany(Rhine River).

The book is subdivided into five chapters each dealing with a separate aspect of assessment of thermal pollution effects. The first chapters discuss natural and induced temperature fluctuations in flowing streams, lakes, estuaries and seas and in groundwater. Of these bodies of water the most threatened are fresh-water surface resources. The relationship between cooling requirements and natural water temperature is briefly discussed. Detrimental effects of heated discharges on the oxygen balance consist mainly of decreasing solubility of oxygen with increasing water temperature and increasing oxygen demand due to increased biochemical reaction rates. Effects on aquatic life of temperature and its variations are discussed from the standpoint of type of species and place of its occurrence. Influence of temperature on other water quality elements such as nitrogen balance, or corrosion properties are outlined. Further chapters deal with methods for estimation of such heat budget elements as influent and effluent temperatures in powerplant condensers, evaporation and radiation heat losses and gains, wind effects, mixing and convection factors, all taking into consideration the annual variation of meteorological conditions. Current and future thermal regimes in the Rhine River models and actual measurements. (Oleszkiewicz-Vanderbilt) W74-04764

ANALYSIS OF TRACE ELEMENTS, PHOSPHORUS AND SULPHUR, IN THE LIPID AND THE NON-LIPID PHASE OF HALIBUT (HIPPOGLOSSUS HIPPOGLOSSUS) AND TUNNY (THUNNUS THYNNUS), Central Inst. for Industrial Research, Oslo For primary bibliographic entry see Field 5A. W74-04770

HYDROCARBON AND CHLOROPHYLL: A CORRELATION IN THE UPWELLING REGION OFF WEST AFRICA, Kiel Univ. (West Germany). Institut fuer Meereskunde For primary bibliographic entry see Field 5B.

APPARATUS FOR RECORDING AVOIDANCE MOVEMENTS OF FISH, Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst. For primary bibliographic entry see Field 5A.

W74-04776

MERCURY UPTAKE AND ION DISTRIBUTION IN GILLS OF RAINBOW TROUT (SALMO GAIRDNERI): TISSUE SCANS WITH AN ELECTRON MICROPROBE, Michigan State Univ., East Lansing. Dept. of

Physiology For primary bibliographic entry see Field 5A. W74-04778

BIOASSAY PROCEDURES TO EVALUATE BIOASSAY PROCEDURES TO EVALUATE
ACUTE TOXICITY OF NEUTRALIZED
BLEACHED KRAFT PULP MILL EFFLUENT
TO PACIFIC SALMON,
Fisheries Research Board of Canada, West Van-

J. C. Davis, and B. J. Mason.
Journal of the Fisheries Research Board of Canada, Vol 30, No 10, p 1565-1573, October 1973.
4 fig., 4 tab, 21 ref.

Descriptors: *Bioassay, *Toxicity, *Sockeye sal-mon, *Pink salmon, *Pulp wastes, Industrial wastes, Pulp and paper industry, Mortality. Identifiers: Bleached kraft pulp mill wastes, *Coho salmon, Survival, Data interpretation, Continuous flow system.

A series of bioassays was carried out to assess the acute toxicity of neutralized, filtered, bleached kraft pulp mill effluent (BKME) from a single mill to underyearling Pacific salmon in fresh soft water, at 10-13 C. Toxicity expressed in terms of the 96-hr LC50 varied from 22 percent of full strength BKME to nontoxic in different collections. A procedure is described for estimating the 4-day LC50 from geometric mean survival time data. Toxicity of effluents changed unpredictably with storage (even at 2 C), and declined with air stripping. Comparison of continuous flow and stripping. Comparison of contamous flow and static test procedures indicated that continuous flow procedures yield somewhat higher toxicity results than static tests. Experiments with varying fish densities indicate that measurable toxicity is insi uensitues indicate that measurable toxicity is less in static tests with heavy fish loading. Use of loading densities of 2.5 liters/g fish or better is recommended. Young sockeye salmon (Oncorhynchus nerka) appeared most sensitive, and pink (O. gorbuscha) and coho (O. kisutch) salmon somewhat more resistant to toxic BKME solutions. No correlation was found between time to death and condition factor in the size range of undervearling coho tested (3.0-7.3 cm). Recom-mendations are made for routine and regulatory bioassay procedures. (Little-Battelle) W74-04779

EFFECTS OF CADMIUM AND COPPER ON THE OXIDATION OF LACTATE BY RAINBOW TROUT (SALMO GAIRDNERT) GILLS, Fisheries Research Board of Canada, West Vancouver (British Columbia). Vancouver Lab. E. Bilinski, and R. E. E. Jonas. Journal of the Fisheries Research Board of Canada, Vol 30, No 10, p 1553-1558, October 1973.

Descriptors: *Bioassay, *Cadmium, *Copper, *Rainbow trout, *Oxidation, Animal physiology, Heavy metals, Toxicity, Water pollution effects, Mortality, Radioactivity techniques, Inhibition, Chemical analysis, Fish physiology. Identifiers: *Lactates, Sample preparation, Histology, Gills, Biological samples, In vitro tests.

The purpose was to determine whether or not the exposure of rainbow trout to copper and cadmium salt solutions results in a significant inhibition of lactate oxidation in gills. Fish were exposed to 11.2-0.0112 mg/1 CdCl2 for 4-96 hr in fiberglass tanks. After exposure, fish were decapitated, the gill arches cut out, and gill filaments removed and weighted. The oxidation activity in gill filaments. weighed. The oxidative activity in gill filaments was determined by measuring the liberation of C-14-labeled CO2 from C-14-labeled Na-lactate-3-C. Gills were also analyzed for Cd and Cu content

and examined histologically. At the highest Cd concentration (11.2 mg/1), fish died in 7 hr. At 1.12 mg Cd/1, fish mortality was 50 percent; of the fish surviving, oxidative activity was inhibited by 50 percent. All fish died in 24 hr when exposed to the highest level of copper (0.636 mg/1). At a concentration of the conce nighest level of copper (0.35 mg/l). At a concentration of 0.064 mg (2u/l, 50 percent of the fish died; of those surviving, oxidative activity was inhibited by 53 percent. Comparatively high levels of cadmium (20 micrograms) or copper (50 micrograms) were needed to produce in vitro inhibition of lactate oxidation by gill filament. The histological studies suggest that impairment of oxidative activity might be due to disruption of cellular organization or to inhibition of enzyme activity. The lactate oxidation test appears to be useful only at high levels of Cd and Cu, however it could be useful in detecting gill damage with other toxicants. (Little-Battelle) W74-04780

HETEROTROPHIC UTILIZATION OF SUCROSE IN AN ARTIFICIALLY ENRICHED

Manitoba Univ., Winnipeg. Dept. of Microbiology. B. M. Thompson, and R. D. Hamilton. Journal of the Fisheries Research Board of Canada, Vol 30, No 10, p 1547-1552, October 1973.

Descriptors: *Eutrophication, Kinetics, Bioassay, Metabolism, Water pollution effects, Lakes, Carbon, Nitrogen, Phosphorus, Radioactivity techniques, Sampling, Aquatic microorganisms, *Path of pollutants, Photosynthesis, *Canada. Identifiers: Substrate utilization, Biotransformation, *Sucrose, Fate of pollutants, *Organic car-bon, *Heterotrophic bacteria, Particulate matter,

Lake 304 in the Canadian Shield area was enriched with C, N, and P as sucrose, ammonium chloride, and orthophosphoric acid to investigate the role of organic carbon in eutrophication. The investigation included study of the kinetics of sucrose transformation, comparison of particulate carbon produced by heterotrophic processes with that produced by algal photosynthesis and supplied by other sources, disappearance of sucrose im-mediately after enrichment using a laboratory experiment, and comparison of the uptake of glucose and sucrose in lakes 304 and 227. The lake was en-riched with C-14-labeled sucrose at a rate of 5.54 g C/sq m/yr. Heterotrophic activity exhibited fluc-tuations representing the damped oscillations of a disturbed steady state system, stabilizing 3 months after the commencement of enrichment. By late summer, reduction of the weekly addition of sucrose to a few micrograms per liter was accom-plished within a day by the increased microbial acplished within a day by the increased microbial activity resulting from rapid growth of heterotrophic microorganisms. Heterotrophic conversion (preenrichment) of sucrose to particulate carbon in the epilimnion between July and October 1971 was 2-17 percent of primary production. 25-35 percent of total sucrose utilized was converted to carbon dioxide, the remainder being incorporated into particulate material or released as nonvolatile products of metabolism. (Little-Battelle) W74-04781

DIURNAL VARIATION OF DISSOLVED INOR-GANIC CARBON AND ITS USE IN ESTIMAT-ING PRIMARY PRODUCTION AND CO2 INVA-SION IN LAKE 227, Fisheries Research Board of Canada, Winnipeg

(Manitoba). Freshwater Inst. For primary bibliographic entry see Field 5A. W74-04784

A NUMERICAL MODEL FOR DETERMINING INTEGRAL PRIMARY PRODUCTION AND ITS APPLICATION TO LAKE MICHIGAN, isconsin Univ., Milwaukee. Center for Great Lakes Studies.

Group 5C-Effects Of Pollution

Journal of the Fisheries Research Board of Canada, Vol 30, No 10, p 1447-1468, October 1973. 16 fig. 1 tab, 28 ref, 1 append.

Descriptors: *Primary productivity, *Lake Michigan, *Phytoplankton, *Light, *Mathematical models, *Carbon, *Computer programs, Statistical methods, Absorption, Data processing, Seasonal, Photosynthesis. Identifiers: Accuracy.

A computer-based model for determining production by phytoplankton, integrated over depth and over an arbitrary time interval, is described. The solution incorporates light inhibition and uses the actual distribution of surface irradiance for the time interval of interest, since it is not possible to predict the detailed nature of cloudiness. Statisti-cal procedures for estimating the model paramefrom experimental data relating the rate of carbon uptake to irradiance are described. The model is applied to data collected from May 27, 1970 through February 3, 1971, from Lake Michigan. Integral primary production was bimodal at inshore and offshore stations with minimum production in midsummer and winter. There was great daily variability of integral production, due to variation of light. From this it inferred that occasional in situ measurements would give a very poor knowledge of true seasonal trends. The model output was verified by perform-ing two in situ experiments. The agreement was better than 95 percent on both dates. The model makes it possible to estimate integral primary production on a routine basis in large water bodies with well-mixed photic zones. (Little-Battelle)

PRODUCTION OF EPILITHIPHYTON IN TWO LAKES OF THE EXPERIMENTAL LAKES AREA, NORTHWESTERN ONTARIO, Fisheries Research Board of Canada, Winnipeg

(Manitoba). Freshwater Inst. D. W. Schindler, V. E. Frost, and R. V. Schmidt. Journal of the Fisheries Research Board of Canada, Vol 30, No 10, p 1511-1524, October 1973. 10 fig. 2 tab. 27 ref.

Descriptors: *Gas chromatography, *Benthic Descriptors: "Gas chromatography, "Benthic flora, "Primary productivity, "Absorption, "Photosynthesis, "Carbon, Bioassay, Algae, Methodology, Seasonal, Mechanical equipment, Dissolved oxygen, Radioactivity techniques, Chlorophyll, "Canada, Lakes, Periphyton. Identifiers: Scintillation counting, Substrates, In-cubation chambers, Dissolved inorganic carbon, Sample preparation.

Two new techniques for measuring photosynthesis by benthic algal flora in waters low in dissolved inorganic carbon are described. The first uses gas chromatography to measure changes in DIC in incubation chambers directly. The second is a variation of the usual C-14 procedure, in which disap-pearance of C-14 from the water is measured by liquid scintillation instead of uptake of C-14 by the algae. This procedure is simpler than measuring the uptake of C-14, because digestion and/or combustion of samples is not necessary. Results are compared with the commonly employed C-14 uptake and O2 release techniques. Tests showed that heterogeneity of substrate was the major source of variation in in situ results, being large enough to make interpretation of seasonal effects and other causal factors extremely difficult. Annual production by epilithiphyton in two natural lakes in the Experimental Lakes Area (ELA) was 5.19 g C and 5.18 g C/sq m of substrate annually for lakes 239 and 240, respectively. These are the lowest values recorded for freshwater lakes at temperate latitudes. Because DIC and O2 concentrations could be measured simultaneously, it was possible to calculate photosynthetic quotients on several dates. These were extremely high, averaging 2.6 for the summer of 1971. (Little-Battelle) EUTROPHICATION OF LAKE 227 BY ADDI-TION OF PHOSPHATE AND NITRATE: THE SECOND, THIRD, AND FOURTH YEARS OF ENRICHMENT, 1970, 1971, AND 1972, Fisheries Research Board of Canada, Winnipeg

(Manitoba). Freshwater Inst. D. W. Schindler, H. Kling, R. V. Schmidt, J.

Prokopowich, and V. E. Frost. Journal of the Fisheries Research Board of Canada, Vol 30, No 10, p 1415-1440, October 1973. 15 fig. 4 tab. 26 ref.

Descriptors: Limiting factors, *Phosphates, *Nitrates, *Eutrophication, *Carbon, *Canada, Growth rates, Dominant organisms. *Phytoplankton, *Primary productivity, Nutrients, Standing crops, Succession, Water pollution effects, Photosynthesis, Sedimentation, Lakes, Silicates, Sodium, Dissolved oxygen, Calcium, Magnesium, Potassium, Hydrogen ion con-centration, Bicarbonates, Carbonates, Carbon dioxide, Suspended solids, Dissolved solids, Seasonal.

Identifiers: Cryptophyta, Chroococcus, Oscillatoria, Pseudoanabaena, Lyngbya, Coleps, Spondylosium, Synedra, Dictyosphaerium, Oocystis, Ankistrodesmus, Chrysochromulina parva, Chromulina, Chrysococcus, Kepherion, Pseudokepherion, Botryococcus braunii, Dinobryon, Mallomonas pumilio, Staurastrum paradoxum, Staurastrum defectum, Staurastrum boreale, Sphaerozosma granulatum, Spondylosium planum, Chroococcus limneticus, Mallomonas elongatum, Mallomonas caudata, Mallomonas cf.

Lake 227, a small lake with extremely low concentrations of dissolved inorganic carbon, was fertilized with PO4 and NO3 for 4 years, beginning in The additions increased natural inputs of phosphorus and nitrogen about five times. Phytoplankton standing crop increased nearly two orders of magnitude, and the Cryptophyceae and Chrysophyceae present in natural lakes of the area were replaced by Chlorophyta and Cyanophyta. The standing crop of phytoplankton per square meter was near the maximum which could theoretically be maintained by surface light, in spite of the low carbon concentrations. Added phosphate and nitrate were rapidly removed by phytoplankton, so that concentrations in the lake remained low. Almost all of the added nutrient was retained by the lake, in spite of relatively fast water renewal times. An average of 80 percent of the phosphorus income of the lake was sedi-mented. There was no return of phosphorus from sediments in spite of anoxic conditions in the hypolimnion. Photosynthesizing plankton reduced dissolved inorganic carbon concentrations severely, causing a flux of atmospheric CO2 into the lake. From 69 to 95 percent of the inorganic plus particulate carbon supplied to the lake was from the atmosphere. Results demonstrate that low carbon concentrations do not hinder eutrophication if phosphorus and nitrogen supplies are adequate. (Little-Battelle) W74-04789

THE TRANSPORT OF ORGANIC CARBON TO ORGANISMS LIVING IN THE DEEP OCEANS, Dalhousie Univ., Halifax (Nova Scotia). Inst. of Oceanography.

R. O. Fournier.

Proceedings of the Royal Society of Edinburgh, Section B (Biology), Vol 73, No 18, p 203-211, 1971-1972. 1 fig, 2 tab, 46 ref.

Descriptors: *Benthic fauna, *Distribution patterns, *Cycling nutrients, Nutrient requirements, Deep water, *Nutrients, Depth, Food chains, Oceans, Sampling, Theoretical analysis, Energy transfer, Deep-water habitats, Spatial distribution. Identifiers: Transport, *Organic carbon, *Olive-green cells, Marine environment, Sample prepara-

Of the theories which have been proposed to explain the mechanism of organic carbon transport to its point of utilization in the deep ocean, none is adequately quantified to demonstrate its validity. A new mechanism is proposed based upon the oc-currence of the so-called olive-green cells at various depths that suggests these cells may contribute up to 35 percent of the carbon requirements of the benthic fauna in the deep ocean. Quantitative data were obtained by collecting water with sterile or non-sterile samplers, filtering it through a mem-brane filter, and clearing and mounting the filter for microscopic examination. The cells are pigmented, possibly procaryotic organisms of uncer-tain identity. The cells were generally absent from the upper 50 m, increased in number from 50 m to a maximum at 300-500 m., and gradually decreased down to 400 m. The suggestion that these cells are the source of carbon for benthic organisms is based on three factors. First, the distribution of these cells varies directly with the level of surface productivity. Second, the negative gradient of the cell concentration below 300-500 m suggests that they are utilized throughout the water column. Third, other studies have identified similar cells in the guts of benthic and pelagic organisms. (Little-Battelle) W74-04790

HORIZONTAL DISTRIBUTION OF CHEMICAL AND PHYSICAL TERISTICS IN LIPNO RESERVOIR, CHARAC-Ceskoslovenska Akademie

Hydrobiologicka Lab. Z. Brandl.

Hydrobiol Stud. 3. p 53-89, Illus, 1973.

Identifiers: Chemical constituents,
*Czechoslovakia(Lipno reservoir), Distribution(Horizontal), Physical properties, Reservoirs,
*Temperature, *Transparency, *Phosphorus, constituents.

Temperature, transparency and concentration of some chemical constituents in water were studied at various stations of the shallow, mostly nonstratified Lipno Reservoir (Czechoslovakia) and in some inflows during 1964-66. Slight increase in al-kalinity and transparency and decrease of water color and the total P were found from the inflow to the dam. The dissolved and particulate Kjeldahl N had the most constant and the ammonia N the most variable distribution. The variation in nitrate concentration is originated due their more fast decrease at shallow stations. The separated Olsina bay and its inflowing creek differed markedly so that they may be considered as different water masses. The homogeneity of the remaining reservoir was high but different in different years: The voir was high out different in different years. The variability of stations, was smaller in the years with shorter renewal time of water.—Copyright 1973, Biological Abstracts, Inc.

COMPARATIVE STUDY, IN 1966 AND 1967, OF THREE RESERVOIRS IN THE PROJECT OF A NATURAL PARK IN THE MORVAN REGION

(IN FRENCH), Institut National de la Recherche Agronomique, Thonon-les-Bains (France).

Thonon-les-Bains (France). Station d'Hydrobiologie Lacustre.

J. Feuillade, and M. Feuillade.

Ann Hydrobiol. 2(2): p 143-174, Illus, 1971, En-

glish summary.

Identifiers: *Algae, *Cyanophycea, Fishes, *France(Morvan region), *Microorganisms, Mixing, Oxygen, Parks, Physicochemistry, Recreation, Reservoirs, Sediments, Wind, *Productivity.

The physicochemistry and microbiology of 3 neighboring dammed lakes in France were studied. Settons reservoir is broad and shallow (6.50 m in the middle); water catchment is near the surface. and total water mixing is by wind. Its sediments are the most heterogeneous, thin and lying on a peat older than the lake itself. Crescent reservoir is deeply embanked, or irregular form; each of its 2

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Waste Treatment Processes—Group 5D

branches receives an effluent from the other lakes: it has a depth of 25 m at the station near the dam; it has a depth of 25 m at the station near the dam; there are 2 effluents, 1 above the upper part of the dam and the other at its base. O2 depletion occurs during summer with stagnation in the bottom. Its sediments are the finest and can retain much water; superficial sediments are the most reducing in late hot season. The greatest numbers of microorganisms occur during the warmest months. Chaumecon reservoir has a depth of 32 m at the dam base; the water catchment is at the base of the dam. The uppermost level is productive. There is dam. The uppermost level is productive. There is no appearance of reducing power on the bottom and no diffusion of reduced matter towards the upper layers. Very strong oxidizing activity destroys organic matter. The fish productivity is best. Algal and microbial proulations differ from those of the other lakes. The differences metabolism of the lakes are caused mainly by the location of the water catchments and by the level variations. A factor stimulating cyanophycean growth appears in Settons Reservoir. For recreational fishing, Crescent Reservoir, which favors aerobic life, is the least favorable.—Copyright 1973, Biological Abstracts, Inc. W74-04815

MICRO- AND MESOBENTHOS DEVELOP-MENT AS A FACTOR OF SOIL COMPOSITION (IN RUSSIAN),
Akademiya Nauk URSR, Kiev. Instytut

Akademiya Hidrobiologii.

For primary bibliographic entry see Field 2H. W74-04816

ECOLOGY AND BIOCOENOLOGY OF LAGU-NAS OR LAKES OF THIRD ORDER OF THE TEMPERATE NEOTROPICAL REGION (SOUTHEAST PAMPASIC REGION OF ARGEN-TINA), (IN SPANISH), La Plata Univ. (Argentina). Instituto de Lim-

nologia.

For primary bibliographic entry see Field 2H. W74-04817

RATIO OF ORGANIC CARBON WITH DIFFERENT TYPES OF OXIDIZABILITY IN THE OPEN WATER OF BAIKAL (IN RUSSIAN),

E. N. Tarasova. Gidrobiol Zh. 8(5): p 70-75, Illus, 1972. Identifiers: *Organic carbo
*USSR(Lake Baikal), *Oxidation. Seasonal.

The organic matter of Lake Baikal (USSR) was determined on the basis of the content of C and by means of oxidation of potassium bichromate in concentrated sulfuric acid and by potassium permanganate in an acidic medium. Data are given on the seasonal changes of the content of organic C, permanganate oxidizability in an acid medium, and bichromate oxidizability in the open waters of Baikal. The ratio of O2 of permanganate oxidizability to the O2 of bichromate oxidizability serves to some extent as a qualitative characteristic of organic matter.--Copyright 1973, Biological Abstracts. Inc. W74-04819

5D. Waste Treatment Processes

MANAGEMENT OF STORMWATER RUNOFF

IN SUBURBAN ENVIRONMENTS, Engineering-Science, Inc., Cincinnati, Ohio. G. D. Beers.

Available from National Technical Information Available Holin Valuolar Technical Technical Technical Service as PB-228 010 \$4.50 in paper copy, \$1.45 in microfiche. Project Completion Report, November 1973. 111 p, 45 fig, 20 tab, 24 ref. C-2079(3395)(1).

Descriptors: Precipitation(Atmospheric), Model studies, *Management, *Urban runoff, *Storm runoff, Suburban areas, Urban hydrology, Cities,

Urbanization, *Water demand, *Water reuse, Water quality, Attitudes.
Identifiers: *Suburban watersheds

The overall objective was to assess the feasibility of managing surface runoff from various suburban watersheds to meet suburban water demands. Definitive results were not anticipated from this study but, rather, a first-cut definition of an essentially uncharted area in suburban hydrology would be constituted. Although it appears technically possible to incorporate stormwater runoff into the suburban water resources arsenal, a number of areas require additional information before the overall feasibility can be ascertained. First, information is needed on the current status of suburban social attitudes towards the re-use of storm-water and all that it implies. Second, it seems reasonable to expect that certain modifications could be made to suburban watershed surfaces, and in man's use of them, with resultant higher quality runoff flows from these watersheds.

W74-04302

COLOR REMOVAL FROM TEXTILE DYE WASTE BY COAGULATION.

Auburn Univ., Ala. Dept. of Civil Engineering. J. F. Judkins, Jr.

J. F. Judkins, Jr.
Available from National Technical Information
Service as PB-228 635 \$4.25 in paper copy, \$1.45 in
microfiche. Completion Report, June 30, 1970, 23
p, 9 tab, 9 ref. OWRR A-01i-ALA(1).

Descriptors: *Waste water treatment, *Coagulation, Color, *Coagulants, Dyes, Textiles, Industrial wastes, *Sulfates, Biochemical oxygen demand.

Identifiers: *Color removal, *Textile dye wastes, *Alum coagulation, Ferric sulfate.

The purpose was to determine if color removal by coagulation could be made more economical by optimizing the coagulant dosage and pH range for the treatment of a waste. Two coagulants, ferric the treatment of a waste. Iwo coagulants, terric sulfate and aluminum sulfate were compared as to their relative costs and coagulating power for the treatment of sulfur and vat dye waste and of a mixture of vat and sulfur dye waste. The possibility of reducing the coagulant dosage by using a synthetic polymer as a coagulant aid was also investigated. In addition to color removal, reductions in BOD of the waste as a result of coagulation were studied. This research investigated color removal from concentrated dye waste samples only; samples were collected from a sewer which received the were collected from a sewer which received the discharge from the dyeing machine at a local textile mill. The following conclusions were made: Coagulation with alum following pH adjustment was the most efficient of the methods investigated for removing color from sulfur dye waste. Hydrogen sulfide gas production becomes a problem in treating sulfur dye waste with pH values of 4.0 and below. The use of Separan coagulant aids is not justified. It is difficult to remove color from yat dye waste with any of the remove color from vat dye waste with any of the coagulants investigated. Ferric sulfate appears to be the coagulant of choice for treating 50% vat 50% sulfur dye mixture if a final pH of 11.2 can be tolerated. Treatment of a 50% vat - 50% sulfur dye waste at pH 7.0 can be accomplished most economically with alum. Some BOD removal results from decolorizing dye waste. W74-04303

SOCIAL, ECONOMIC, ENVIRONMENTAL, AND TECHNICAL FACTORS INFLUENCING WATER REUSE, Utah Center for Water Resources Research,

Otan Center for water Resources Research, Logan.

A. B. Bishop, S. Pratishthananda, J. Keith, C. Colton, and A. B. Crawford.

Available from National Technical Information Service as PB-228 146 \$3.25 in paper copy, \$1.45 in microfiche. Utah Water Research Laboratory Publication PRJERO25-1, December 1973. 40 p, 13 fig, 3 tab, 147 ref. OWRR A-016-UTAH(1). 14-31-0001-3845.

Descriptors: *Reclaimed water, *Water reuse, *Recycling, *Impaired water use, *Social aspects, Social change, *Economic efficiency, Treatment, Legal aspects, *Environmental control.

The potential for wastewater salvage and reuse in a region is described in terms of the systems relations among the social and economic parameters affecting reuse of water and the environmental and technological aspects of wastewater disposal or salvage. Components of the hydrologic system are abstracted in network flow diagram which shows the water supply sources that are influent to water using activities (municipal, industrial, agricultural, fish and wildlife, and recreation) and e discharge of effluents from these activities. This framework is used to identify mechanisms-technological, economic, social, legal, and en-vironmental--that will control or influence water reuse. Analyses include: (1) Technological-treatment and salvage/reuse technologies needed to upgrade water quality for reuse; recycling process water as related to places for application in the system, (2) Economic—influence of economic market mechanisms on reuse; implementation of various economic measures in promoting or discouraging reuse (e.g. incentive payments, taxes, penalties), (3) Social-assessment of attitudes, interests and norms of individuals and groups that affect reuse of water; sources of resistance to change and determination of social change necessary for acceptance of water reuse. (4) Legal-laws affecting the possibility of water reuse such as water rights, water management institutions, and water quality legislation, (5) Environmental-physical and biological considerations in the environment affecting reuse. W74-04317

WATER SUPPLY AND WASTE DISPOSAL CONCEPTS APPLICABLE IN PERMAFROST

Alaska State Dept. of Environmental Conservation. Fairbanks.

In: International Conference on Permafrost 2nd, Yakutsk, USSR 1973. p 577-581, 1973. 1 fig, 2 tab,

Descriptors: *Water supply, *Waste water disposal, *Waste water treatment, *Cold regions, *Arctic, Permafrost, Surveys, Conferences, Environmental engineering.

At permafrost and cold-dominated sites, water supply and waste disposal systems are especially subject to damage from freezing. Such damage may impair site, processes, and facilities. Several different concepts have been used to reduce the risk of damage. Current technology is adequate to insulate, heat, enclose, monitor, and otherwise provide protection. Dependability as well as costs for heat-sensitive systems present serious problems. Temperate climate concepts require input of heat energy. They are highly susceptible to failure under cold stress. Large imports of fuel to meet the energy needs of conventional systems are unrealistic on a long-term basis. Radical deparations of the conventional systems are unrealistic on a long-term basis. Radical deparations of the conventional systems are unrealistic on a long-term basis. Radical deparations of the conventional systems are unrealistic on a long-term basis. ture from current practice is indicated if costs are to be reduced significantly and dependability enhanced. Concepts that utilize low temperature or are unaffected by it should be investigated further. Imported energy must be conserved, and cold itself must be exploited as a resource to effectively and efficiently meet demand for water supply and waste disposal service and at the same time maintain environmental excellence on a long-term basis. (See also W74-04346) (Knapp-USGS)

SEWAGE-TREATMENT CONCEPT FOR

PERMAFROST AREAS,
Cold Regions Research and Engineering Lab.,
Hanover, N.H.

S. C. Reed, and T. D. Buzzell.

Group 5D—Waste Treatment Processes

In: International Conference on Permafrost 2nd, Yakutsk, USSR 1973. p 706-712, 1973. 1 fig, 2 tab,

Descriptors: *Sewage treatment. *Permafrost. Acration, Waste treatment, *Waste water treatment, Water temperature, *Construction costs.

A sewage treatment concept was developed for permafrost areas. It is compatible with the permafrost environment and still offers substantial savings in construction costs. The concept adopts the passive approach to construction in permafrost the passive approach to construction in permatrosis protecting the supporting material from thermal stress. The unit is designed to be placed above ground on a gravel pad with the tank slightly elevated on cribbing to permit free air flow underneath. This configuration protects the underlying permafrost from thermal degradation but exposes the tank bottom to the low winter tempera-tures. A number of protective features are in-cluded to prevent freezing of tank contents. The key element is utilization of a floating tube settler, which provides the essential final clarification of the effluent prior to discharge. The compact na-ture of this settler permits installation directly in the aeration tank, thus avoiding the need and costs for separate clarifier tankage. The resulting single-tank-treatment system provides significant thermal and economic advantages for utilization in the permafrost regions of the world. (See also W74-04346) (Knapp-USGS)

DISPOSAL OF RADIOACTIVE WASTES,

Gosudarstvennyi Komitet po Atomnoi Energii SSSR, Moscow. Ispolzovaniyu V. I. Spitsyn, K. P. Zakharowa, L. D. Azamayeva,

and N. V. Krylova.

and N. V. Krytova. Available from NTIS, Springfield, Va., as Rept. No. JPRS-58764. \$4.00 per copy, \$1.45 microfiche. Translation JPRS 58764, April 17, 1973. 71 p, 19 fig. 20 tab, 27 ref.

Descriptors: *Radioactive waste disposal, *Waste Descriptors: "Radioactive waste disposal, "Waste treatment, "Waste storage, Liquid, Solid wastes, Asphalt, Nuclear powerplants, Effluents, Economics, Air pollution, Water pollution, Geology, Hydrology, Sodium chloride, Technology, Management.

Identifiers: "Fuel reprocessing, "Water cooled

Five International Atomic Energy Agency (IAEA) papers dealt with the following topics: technical and economic aspects of handling liquid wastes with intermediate and high levels of radioactivity; the possibility of using bituminization for processing highly active wastes; a technical-economic comparison of the methods of solidification and tank storage for highly active liquid wastes from the processing of spent fuel elements of water-cooled water-moderated power reactors; scientific prerequisites for burying highly active liquid wastes in deep geological formations; and the development of methods for preparing the wastes from hexafluoride technology for burial.
(Houser-ORNL) W74-04445

INDUSTRY AWAITS SOLUTIONS TO PROBLEMS OF HIGH-LEVEL RADIOACTIVE-WASTE MANAGEMENT, S. D. Strauss.

Issue available from POWER, McGraw, Hill, Inc., Pub., Concord, N.H., Single copy \$2.00. Power, Vol 117, No 12, p 23-27, Dec. 1973. 12 fig.

Descriptors: *Radioactive waste Descriptors: "Radioactive waste disposal, "Nuclear powerplants, Effluents, Gas, Liquid, Air pollution, Water pollution, Water pollution sources, Treatment, Treatment facilities, Waste disposal, Geology, "Waste water treatment. Identifiers: "Fuel reprocessing, "Waste storage, "Waste solidification, Salt disposal, Retrievable surface storage Storage contained."

surface storage, Storage containers.

Long-term disposal of high-level radioactive wastes remains one of the unresolved aspects of the nuclear fuel cycle. Most likely possibility is storage in solid form in extremely stable geologic formations. Underground salt beds, under investigation for some time, appear likely to offer safe and stable storage for millions of years. Project Salt Vault, a 19-month study by Oak Ridge, was made to determine feasibility. Any of a number of salt deposits in U.S. can be used if the technique proves acceptable. One method of solidifying high-level liquid radioactive waste is by a calcining process that converts it into granular form, reducing volume approximately 90%. Solids are accumulated in storage bins. Since 1963, AEC has calcined its radioactive liquid high-level waste and stored it in bins 40-60 ft high x 12 ft in diameter, 7 bins to each underground concrete tank. The storage in solid form in extremely stable geologic ter, 7 bins to each underground concrete tank. The bins and tanks in this storage setup are designed to last at least 500 years. Temporary facilities, termed Retrievable Surface Storage, will be provided for high-level solid wastes from commercial reprocessing plants. AEC announced last year a program to design and construct a surface or nearprogram to design and construct a surface or near-surface facility, first module to be ready in time for receipt of the first shipments expected - some time in 1983-4. Others will be added as needed. (Houser-ORNL) W74-04457

AN ASSESSMENT OF THE USE OF POTOMAC ESTUARY WATERS AND AWT EFFLUENTS FOR EMERGENCY WATER SUPPLY,

Meta Systems, Inc., Springfield, Va. G. K. Young, and R. C. Palange. Water Resources Research Center, Washington Technical Institute. Project Report No. 1. October

Descriptors: *Water reuse, *Waste water treatment, *Water quality standards, Recycling, Water supply, Waste water, Disinfection, Toxicity, Public health, *Potomac River, *District of Columbia, Estuaries. Identifiers: *Indirect reuse

Recognizing the resistance to building upstream reservoirs for water supply for the Washington, D.C. area, this study looks at the alternative of waste water reuse including the use of the Potomac estuary. Previous experience with waste water reuse, professional and public opinion as to its acceptability, requirements and guidelines for domestic use of waste water, the health hazards involved, and the identification of operating procedures and precautions for processing waste water for reuse are examined. Examples of reuse include Chanute, Kansas, Santee, California, and Philadelphia. Most examples of reuse involve indirect reuse of waste water which includes natural processes in addition to treatment. Indirect reuse is more acceptable than direct reuse both in terms of public health requirements and public attitudes. Five basic issues are emphasized: disinfection of the waste water to remove viruses; the problem of long-term chronic toxicity; the reliability of the treatment processes, particularly waste water treatment; indirect reuse versus direct reuse; and treatment; indirect reuse versus direct reuse; and public attitudes. Recommendations include: fail-safe procedures should be developed using an experimental pilot plant; an up-to-date inventory of industrial wastes should be made; investigate experiences of reuse in U.S., South Africa and U.S.S.R.; determine hydrodynamic and biologic attributes of Potomac estuary; develop criteria for limits for finished waters derived from waste water contaminated sources; and structure a public relations program. (Elfers-North Carolina) W74-04506

SYRACUSE METROPOLITAN AREA COM-PREHENSIVE PLAN-WATER AND SEWER PLAN AND SERVICES ALLOCATION PLAN, Syracuse-Onondaga County Planning Agency,

C. T. Ladd, and J. A. Martin.

Available from the National Technical Informa-Tion Service as PB-219 042, \$5.75 in paper copy, \$1.45 in microfiche. Prepared for Central New York Regional Planning and Development Board, October 1972. 68 p, 1 map, 10 tab. NYP-246.

Descriptors: *Water supply, *Water demand, *Sewerage, *Utilities, *Comprehensive planning, Land use, Financing, Costs, Environmental effects, Coordination, Water quality, Inter-agency cooperation, Equity, *New York. Identifiers: *Disparities, Utility extension, Syracuse(N.Y.), Equitable apportionment.

Several policies are recommended in this development plan which seeks to establish efficient and equitable water and sewer services. Environmenequitable water and sewer services. Environmental pollution would be alleviated by upgrading existing public works systems and by providing necessary facilities to already developed neighborhoods. Capacities of new public facilities should be designed to be incremental whenever possible. be designed to be incremental whenever possible.
Additional population growth would be accommodated first within the existing and programmed sanitary districts. As optimal levels of development are approached, preparation for new demands within satellite systems would be made. The establishment of public sewer and water districts within preservation districts areas would be discouraged. Tax disparities should be eliminated for identical services and the hearficiaries of new disconlaged:

The disconlant of the beneficiaries of new systems and facilities should pay their full share of development, operating, and maintenance costs. A coordinated capital improvements program for all local governments would be established. Scope of sources of the present system, plus anticipated future needs are discussed. (Edwards-North W74-04507

PRATTVILLE, ALABAMA COMMUNITY DEVELOPMENT PLAN, VOL. II: SUMMARY AND ILLUSTRATIONS.

AND ILLUSTRATIONS.
Central Alabama Regional Planning and Development Commission, Montgomery.
Report No. ALA-CAP-1415-1020-03. June 1973. 54 p, 42 fig, 3 tab. ALA-RX09-1020-0.

Descriptors: *Planning, *Water supply, *Sewerage, *Water demand, *Utilities, *Alabama, Financing, Costs, Water quality, Urban land use, Environmental effects, Drainage, Design, Timing, Scheduling, Investment.
Identifiers: Utility extension, Prattville(Ala),
Urban growth, Alabama River.

Major features identified as a part of the Community Utility Plans are: all areas proposed for urban development to be serviced with public water and sewer; all extensions of water and sewer lines are planned to guide the location and density of development; water supply and pressure is to be designed for maximum domestic use plus max-imum fire fighting needs; equity of distribution (supply and pressure) is to be achieved through minimum line diameter of 6 inches, through the lo-cations of wells and storage facilities, and looping to reduce dead-end lines; sewer lines are designed for capacity growth utilizing a system of trunk lines and laterals; and drainage improvements are proposed to protect natural drainageways and to proposed to protect natural drainageways and to handle storm runoff from capacity development. Current estimates indicate the supply of water from wells will be sufficient to serve the future population. The sewer system in Prattville's most acute problem. Sewage treatment plant has in-adequate capacity. Numerous breaks produce age flows into creeks. Relocation of the plant, construction of a second one, repair of lines, and installation of trunk lines to serve new development will all be necessary. Drainage is not a major problem, although some local improvements are needed. Steps should be taken to preserve natural drainageways. Erosion in some places has produced difficulties. Expenditures on community utilities are included in the proposed capital im-

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Waste Treatment Processes—Group 5D

provements budget for the period 1974 to 1980. (Edwards-North Carolina) W74-04508

COMMUNITY WATER SUPPLY. Agency for International Development, Washington, D.C. Office of the War on Hunger. For primary bibliographic entry see Field 4B. W74-04510

HOUSING AND PLANNING REFERENCES. Department of Housing and Urban Development, Washington, D.C. For primary bibliographic entry see Field 3D. W74-04511

COLOR OF PULP INDUSTRY WASTE LIQUORS. III. THE INTERACTION OF CHLORO-OXYLIGNIN WITH METAL SALTS

(IN JAPANESE), Kyushu Univ., Fukuoka (Japan). Faculty of

Kyusnu Chris, Agriculture.

K. Sameshima, M. Sumimoto, and T. Kondo.

Mokuzai Gakkaishi (Journal of the Japan Wood Research Society), Vol 19, No 3, p 125-130, March 1973. 10 fig, 1 tab, 10 ref. English summary.

Descriptors: *Color, *Pulp wastes, *Bleaching wastes, *Waste water treatment, *Lignins, *Cations, Additives, Chemicals, Inorganic compounds, Nitrates, Water pollution sources, Waste treatment, Industrial wastes, Pulp and paper industry, Hydrogen ion concentration, Foreign

research.
Identifiers: Chlorine compounds, Kraft mills,
Chromophores, Thiolignin, Chlorolignin,
Lignosulfonic acids, Japan.

Attempts to remove color from bleached kraft Attempts to remove color from bleached krait pulp mill effluents must focus on chlorinated oxidized lignin as the major chromophoric constituent in such wastes. Among 16 different metal nitrates examined for decoloring efficiency, trivalent cations were found to be superior to divalent ones and much superior to monovalent ones. The most effective cations were Fe(III), Al. Cr(III), and Pb(II). Since their action on chloro-oxylignin decreased greatly at alkaline pH, waste water treatments should preferably be conducted water treatments should preterably be conducted in the acidic range. Among different lignin-bearing wastes, oxylignin solutions were more readily decolored than lignosulfonic acid solutions, but slightly less readily than thiolignin solutions. (Brown-IPC)
W74-04512

ENVIRONMENTAL CHEMISTRY: AIR AND WATER POLLUTION,
Weber State Coll., Ogden, Utah. Dept. of Chemis-

For primary bibliographic entry see Field 5B. W74-04513

ASPECTS OF COLOUR REMOVAL FROM PULP AND PAPER MILL EFFLUENTS, Central Public Health Engineering Research Inst., Nagpur (India).

P. V. R. Subrahmanyam, P. C. Sachan, and G. J. Mohanrao

TPPTA (Journal of the Indian Pulp and Paper Technical Association), Vol 9, No 1, p 20-23, January-March 1972. 2 tab, 12 ref.

Descriptors: *Pulp wastes, *Waste water treatment, *Lignins, *Color, Effluents, Soil chemical properties, *Ion exchange, *Cation adsorption, Adsorption, Waste water(Irrigation), Irrigation, Land use, Soil disposal fields, Filtration, Percola-

Lignin is not only an esthetically offensive, but also a difficultly biodegradable pollutant. Effluent color caused by lignin can be removed by chemical

methods, such as massive lime dosage, biological methods, such as activated sludge treatment and fungal degradation, and physical methods, such as adsorption on activated carbons or soils. Eight different soils were investigated for color-removing capacity. Laboratory results showed that color reduction was proportional to the cation-exchange capacity of the soils. The amount of land area required for pulp mill effluent treatment by this method is calculated, assuming steady percolation and evaporation rates. (Wise-IPC) W74-04514

MECHANICAL CLARIFICATION OF INDUS-TRIAL WASTE WATERS (MECHANISCHE KLAERUNG VON INDUSTRIEABWAESSERN). Allgemeine Papier-Rundschau, No 46, p 1668, Nov. 20, 1972. I fig.

Descriptors: *Flotation, *Waste water treatment, Pulp wastes, *Treatment facilities, Suspended solids, Fibers(Plant), Settling, Aeration, Activated sludge, *Industrial wastes, Pulp and paper indussludge, *Industry, Effluents. Identifiers: Krofta Sedifloat

The 'Krofta Sedifloat' is a saveall developed primarily for the removal of fibers from paper and paperboard mill effluents. Its operation is based on the principle of flotation, rather than sedimentause principle of Hotation, rather than sedimenta-tion. It is also suitable for the aftertreatment of aeration tank discharges containing activated sludge. Advantages of flotation over sedimenta-tion as mechanical solids-removal methods are pointed out. (Brown-IPC) W74-04515

MODERN WASTE WATER TREATMENT AND PROCESSING TECHNIQUES IN THE PAPER AND BOARD INDUSTRY (MODERNE ABWAS-SERAUFREREITUNGS-IND VERFAHREN. STECHNIK IN DER PAPIER- UND KARTONIN-

Lurgi Apparate-Technik G.m.b.H., Frankfurt am Main (West Germany).

W. Schaper.
Das Papier, Vol 27, No 6, p 225-229, June 1973. 5 fig, 1 tab. English summary.

Descriptors: *Treatment facilities, *Pulp wastes, *Waste water treatment, *Equipment, Europe, Pulp and paper industry, Effluents, *Water quality Pulp and paper industry, Efficiency, Valed Appendix Standards, Biological treatment, Chemical precipitation, Coagulation, Flocculation, Sedimentation, Settling basins, Industrial wastes, Waste treatment.

Identifiers: *Germany, Biomat, Sedimat, Biosedi-

Governmental regulations for environmental protection include waste water purification stands for which a variety of treatments are available, including mechanical, chemical, and biological rename memera, man biological processes. German-made equipment for such treatments, suitable to the needs of the paper and paperboard industry, is illustrated, notably the design, construction, operation, and advantages of the 'Sedimat', 'Biomat', and 'Biosedimat'. (Wise-W74-04517

WATER REUSE AND DEPOSITS CONTROL, Buckman Labs., Inc., Memphis, Tenn. S. J. Buckman.

Southern Pulp and Paper Manufacturer, Vol 36, No 4, p 17-20, 22, April 1973. 1 fig.

Descriptors: *Water reuse, *Pulp and paper industry, *Operation and maintenance, Equipment, Maintenance, *Corrosion, *Slime, Effluents, Industrial water, Water conservation, Water circulation, Instrumentation, Measurement, *Recycling. Identifiers: Paper mills, Board mills, Downtime Production losses, Mill management Production losses, Deposits(Scale and slime). management.

Although the recycling of process waters is the best approach to the reduction of effluent volumes in pulp and paper mills, increased reuse of water requires improved measures for controlling deposits of a microbiological nature, such as slime growths, and of nonbiological deposits, such as scales. The results of such deposits can be disas-trous losses in production (due to machinery downtimes); losses in heat, fibrous and chemical raw materials, such as fillers; reduced life of paper machine felts and wires; and reduced product quality. A factory-wide deposits-control program should receive sustained attention from mill management. Practical evaluation and graphic presentation of results are part of the program, as are measuring instruments to obtain the data needed. The construction of a slime-measuring unit is illustrated. (Witt-IPC) W74-04520

EFFECTS OF CONDENSATES ON THE TOXICITY OF KRAFT PULP MILL EFFLUENTS, B.C. Research Ltd., Vancouver.
A. Bruynesteyn, and C. C. Walden.
Pulp and Ppaer Magazine of Canada, Vol 74, No 7, p84-89 (Technical Paper T226), July 1973. 3 fig, 8 tab, 3 ref.

Descriptors: *Toxicity, *Pulp wastes, *Bleaching wastes, Effluents, *Resins, *Evaporators, Waste water(Pollution), *Water reuse, Water pollution sources, Evaporation, Pulp and paper industry, Industrial wastes.

udstriat wastes.
Identifiers: Wash waters, Pulp washing, Kraft pulp, Condensates(Evaporator), Resin acids, Wood extractives, Kraft mills, Bleach plants, Washers(Equipment).

The reuse of evaporator condensates as wash water for brown stock (unbleached kraft pulp) was shown to increase the resin acid content of the washer effluent and its toxicity. Both drum and diffuser washers were evaluated. Although the wood species used in a pulp mill, as well as the car-ryover of adsorbed toxicants into the bleach plant. are factors in effluent toxicity, it should become possible to operate multiple-effect evaporators without producing toxic condensates. (Brown-IPC) W74-04521

WILLAMETTE CLEANUP,

S. Pollitzer.
Pulp and Paper, Vol 47, No 3, p 51-55, March1973.

Descriptors: Water quality control, *Stream improvement, Rivers, *Oregon, *Pulp wastes, *Waste water treatment, Treatment facilities, Pulp and paper industry, Sulfite liquors, Industrial wastes, Waste treatment, Costs, Capital costs, Water quality standards, Law enforcement, Regulation, Fish, Recreation, Water sports, Biological treatment.

treatment.
Identifiers: *Willamette River(Oregon), Sulfite
mills, Chemical recovery, Spent sulfite liquors,
Spent pulping liquors.

In 1972, the Willamette River (Oregon) became the first major U.S. waterway which received industri-al wastes that had all undergone secondary treatment. This massive stream improvement effort involved 9 pulp and paper mills along the river and its tributaries. Although most of these mills possessed primary treatment facilities, they had to construct chemical recovery and secondary treat-ment systems totaling over \$40 million. One sulfite mill closed down, another installed a chemical recovery system for ammonium-base spent sulfite liquor, and two mills converted to the magnesiumbase sulfite pulping process. As a result of the total cleanup program, waste discharges into the river were reduced by 90%, the overall water quality was raised to meet strict federal and state stan-dards, the number of migratory game fish was in-creased, and the sportive use of the water course

Group 5D—Waste Treatment Processes

ws made safer and more enjoyable. A list of all mills affected by the program is included, detailing effluent treatment facilities and their costs (Witt-IPC) W74-04522

A NEW SECONDARY TREATMENT.
Paper Trade Journal, Vol 157, No 19, p 46, May 7, 1973.

Descriptors: Biological treatment, *Waste water treatment, *Pulp wastes, *Biodegradation, *Treatment facilities, Equipment, Microorganisms, Pollutants, Oxidation, Industrial wastes, Waste treatment, Pulp and paper industry, Costs, Operating costs, Settling velocity, Sedimentation

'Bio-Surf' is a pollution-control process developed by Autotrol Corp. that may reduce the costs of secondary waste treatment. The process was recently adapted to the needs of the pulp and paper industry. It utilizes a series of large plastic disks mounted and rotating on a horizontal shaft while partly immersed in the waste water. Biologi-cal growth forming on the disk surfaces performs natural oxidation of nollutants. producing carbon natural oxidation of pollutants, producing carbon dioxide, water and additional microbial cells. The sludge produced has excellent settling properties. The system is said to adjust rapidly to changes in flow volume and pollutant concentration. (Witt-W74-04524

EXTENSIVE EFFLUENT TREATMENT AT HODGE INCLUDES COLOR REMOVAL.
Paper Trade Journal, Vol 157, No 18, p39-40, April

Descriptors: *Waste water treatment, *Louisiana, *Chemical precipitation, *Lime, *Color, *Pulp wastes, Sludge treatment, Sludge disposal, Incineration, Carbon dioxide, Calcium carbonate, Effluents, Pulp and paper industry, Air pollution, Hydrogen ion concentration, Dissolved solids, Suspended solids. Identifiers: Chemical recovery, Lime kilns, Carbonation, Clarifiers, Flue gases, Hodge(La).

A novel feature of the environmental protection facilities at the recently expanded pulp and paper mill of Continental Can Co. in Hodge, La., is an ef-fluent decoloring system, in which lime is added to the waste waters entering the first clarifier stage. Sludge from this primary clarifier, including precipitated color bodies, is incinerated in the mill's lime kiln for recovery of lime. Dissolved lime remaining in the clarified effluent is recovered by treatment with lime kiln stack gases which provide the carbon dioxide needed to precipitate dissolved lime as Ca carbonate. The pH of the clarifier effluent is adjusted before it enters the oxidation ponds for secondary treatment. Air pollution abatement facilities at the mill are also lescribed. (Witt-IPC) W74-04525

FINLAND STARTS PRODUCT PROTEIN FROM BLACK LIQUOR. PRODUCTION OF

Descriptors: *Pulp *Pulp *Proteins, *Waste treatment, Feeds, Carbohydrates, *Fermentation, Foreign research, Europe, Pulp and paper industry, Industrial wastes. Identifiers: Pekilo protein, *Finland.

'Pekilo' protein is produced from the spent sulfite pulping liquor fermentation by fungi. The process is also applicable to the carbohydrate wastes of other industries. It can be licensed from SITV, a consortium of major Finnish pulp and paper com-panies. The product is an odorless cream-colored panies. The product is an odoriess cream-colored powder or granule which has undergone rigorous animal feeding tests. Initial production at United Paper Mills Ltd. in Jamsankoski will be ca. 10,000 tons in 1974. (McClenahan-IPC) W74-04526

POLILITANT REMOVAL HANDROOK.

Noyes Data Corp., Park Ridge, New Jersey (and London, England) 1973. 528 p, Price: \$36.00.

Descriptors: *Pollution abatement, Pollutants, *Chemicals, *Reviews, *Waste treatment, *Waste water treatment, *Air pollution, Water pollution treatment, Waste water(Pollution), Industrial wastes, Chemical industry, Pulp and paper indus-

This compilation, based on a review of various cited literature sources, explains available techniques for the removal of chemical pollutants from water and air. About 130 different polluting chemicals are covered, ranging from acids to zinc, and including some materials found in pulp and paper mill effluents, such as chlorine, dyestuffs, flyash, formaldehyde, and sulfur dioxide. (Brown-W74-04527

CLARIFICATION METHOD OF POLLUTED WATER FROM PAPER MILLS WITH COMBINATION OF BEER EFFLUENT (IN

JAPANESE), Washington Univ., Seattle. Coll. of Forest Resources.

Resources. K. Akagane, and G. G. Allan. Japan Tappi, Vol 27, No 7, p 341-347, July 1973. 9 fig, 5 tab, 5 ref (English summary).

Descriptors: Water pollution sources, Water pollubescriptors: water pollution treatment, *Pulp wastes, *Industrial wastes, *Food processing industry, *Waste water treatment, *Chemical precipitation, Settling velocity, Pulp and paper industry, Chemical industry, Proteins, Lignins, Phenols, Carbohydrates, Herbicides, Clays, Sulfonates.

Identifiers: *Breweries, Beer effluents, Alum(Aluminum potassium sulfate), Aluminum compounds, Hemicelluloses, Lignosulfonates, Al-

The major components of paper mill effluents include hemicelluloses, fine fibers, and polyphenolic compounds, such as lignosulfonates and kraft (sulfate-process) lignin, whereas waste waters discharged by beer factories contain largely proteins. Joint treatment of paper mill plus beer factory wastes with 1% alum produced a large volume of precipitate, whereas this amount of alum had no effect on paper mill effluent alone.
Settling of pollutants was accelerated by the presence of colloidal clay. The precipitated sediments might find commercial use as carriers for controlled-release herbicides. They could also be reused as paperboard filler. (Brown-IPC) W74-04528

APPLICATION OF POLYACRYLAMIDE TO PULP MILL EFFLUENTS (IN JAPANESE), Hokuetsu Paper Mills Co., Ltd., Nagaoka (Japan). M. Sakuma, M. Kimura, and O. Takahashi. Japan Tappi, Vol 27, No 6, p 283-288, June 1973. 10 fig, 3 tab, 5 ref. (English summary).

Descriptors: *Pulp wastes, *Bleaching wastes, *Waste water treatment, Sedimentation rates, *Coagulation, Suspended solids, Additives, *Chemcontrol, Hydrogen ion concentration, Polymers, Organic compounds, Inorganic compounds, Chemicals, Settling velocity, Industrial wastes, Pulp and paper industry, Waste treatment, Chemical oxygen demand, Surfactants.

Identifiers: Alum(Aluminum-potassium sulfate),
*Polyacrylonitrile, Kraft mills, Molecular weight,
Macromolecules, Coagulants, Aluminum com-

In the purification of effluents from bleached kraft pulp mills by addition of polyacrylamide (PAA) as purp mins by addition of polyactypanide (FAA) as a coagulant aid, studies were conducted on the ap-propriate alum dosage, the effects of PAA molecu-lar weight and dose rate, and the effects of pH on coagulation efficiency. The removal of COD load-ing was found to depend on the alum dosage, but not on the PAA dosage. The function of PAA is seen in strong coagulation and rapid sedimentation of suspended solids. For satisfactory coagulation, the PAA preparation should have a molecular weight above 5 million. The settling rate increased with increased PAA dosage. Non-ionic PAA produced the fastest sedimentation at pH 5-7, whereas anionic PAA exerted the most rapid effect at pH 8, regardless of its degree of hydrolysis. (Brown-IPC) W74-04529

LOW COST METHODS FOR TREATING PULP AND PAPER MILL EFFLUENTS,

Central Public Health Engineering Research Inst., Nagpur (India).

P. V. R. Subrahmanyam, R. C. Parekh, and G. J.

TPPTA (Journal of the Indian Pulp and Paper Technical Association), Vol 9, No 1, p 14-19, January-March 1972. 6 fig, 2 tab, 18 ref.

Descriptors: *Pulp wastes, *Waste water treatment, *Water pollution treatment, *Pollution abatement, Pulp and paper industry, Oxidation, Biochemical oxygen demand, Aerated lagoons, Lagoons, Anaerobic digestion, Nutrients, Economic efficiency, Costs, *Operating costs. Identifiers: *India.

The theory, mechanism, and suitability of four low-cost effluent treatment methods for application to pulp and paper mill discharges in India are discussed, namely, the oxidation pond, the oxidation ditch, and the aerated and anaerobic lagoon. Pilot-plant studies with nutrient addition to an anaerobic lagoon indicated BOD reductions for pulp mill effluents of 67% in summer and 50% in vinter. Without nutrient addition, the same reductions required a doubling of retention time, but were considerably cheaper. Laboratory and pilotwere consucrably cneaper. Laboratory and pilot-plant studies with an aerated lagoon achieved BOD reductions of 15-20 mg per liter in 3 days. They indicated also that strong (highly polluted) wastes should be segregated and treated anaerobi-cally in a preliminary stage. (Wise-IPC) W74-04531

HYDROGEN PEROXIDE FOR INDUSTRIAL POLLUTION CONTROL,

FMC Corp., Princeton, N.J. Research and Development Dept. W. H. Kibbel, Jr., C. W. Raleigh, and J. A.

Shepherd. Industrial Wastes, Vol 18, No 6, p 41-45, Nov/Dec 1972. 2 fig, 6 tab, 16 ref.

Descriptors: *Oxidation, *Oxides, Pollution abatement, *Sulfur compounds, *Industrial wastes, *Chemcontrol, Water pollution treatment, *Waste water treatment, *Phenols, Effluents, Chemical industry, Pulp and paper industry, Fuels, Textiles, Plastics, Sulfides, Inorganic compounds, Organic

compounds, Chemicals.

Identifiers: *Cyanides, Hydrogen peroxide, Oxidants, Viscose rayon.

Among the commercial or commercially feasible applications of hydrogen peroxide in pollution control are the removal of sulfur compounds (such as sulfides, mercaptans, and sulfur dioxide) from waste products of the mining, fuel (coke, natural gas, and petroleum), viscose rayon, and kraft pulping industries; the detoxification of cyanides; and the elimination of phenolic compounds from effluent streams of the chemical and plastics industries. These and related applications are described. (Witt-IPC) W74-04532

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Waste Treatment Processes—Group 5D

GRAVITY DEWATERING: APPLICATION TO PAPER MILL WASTES, Permutit Co., Paramus, N.J.

W.L. Schwoyer. Industrial Wastes, Vol 18, No 2, p 18-23, March/April 1972. 6 fig, 1 tab, 2 ref.

Descriptors: *Filters, *Dewatering, *Sludge treatment, Treatment facilities, Suspended solids, *Pulp wastes, *Filtration, *Waste water treatment, Operation and maintenance, Equipment, Fibers(Plant), Industrial wastes, Waste treatment, Pulp and paper industry, Particle shape, Particle

Identifiers: Concentrating(Dewatering), Gravity filters, Thickeners(Machinery), White water, Screw presses, Roller presses.

Mechanical gravity dewatering followed by secondary dewatering in a press is discussed as a means for concentrating paper mill effluents, such as white waters. Dewatering devices employing gravitational force require little power input and maintenance. They produce a clean filtrate, since small particles are not readily pulled from the in-side of the forming filter cake. Gravity thickeners can also handle fragile and gelatinous particles without being clogged by them, and are opera-tional over a wide range of influent solids concen-trations. Several such thickeners are described. Chemical conditioning treatments for waste streams in order to reduce their drainage time are also discussed. Screw presses are used for secondary dewatering of sludges that contain long fibers, whereas multiroller presses are more suited for sludges relatively free of long fibers. (Witt-IPC) W74-04533

PAPERMILI. TREATMENT PLANT FOR PAPERMILL INDUSTRY. SMALL INDUSTRY. Wastes, Vol 18, No 2, p 16-17,

Industrial Wastes, V. March/April 1972. 2 fig.

Descriptors: *Pulp wastes, *Waste water treatment, Treatment facilities, *Coagulation, *Filtration, *Massachusetts, *Connecticut river, New England, Industrial wastes, Waste treatment, Pulp and paper industry, Mixing, Suspended solids, Sewage treatment, Water quality control, Pollution abatement, Effluents, W water(Pollution), Filters, Costs, Capital costs. Identifiers: Microstrainers, Paper mills, Small enterprises.

Strathmore Paper Co. (West Springfield, Mass.) and Esleeck Manufacturing Co. (another paper mill in Turners Falls, Mass.) are jointly using a relatively economical waste treatment facility for removal of effluent suspended solids. The \$850,000 project, built after a pilot-plant study, was partly funded by a federal grant and may point the way to survival of other small paper enterprises faced with 'stop pollution or shut down' orders. Effluents from the two mills are mixed, then treated jointly with a chemical coagulant, and passed through two 10-ft rotary microstrainers before being discharged into the Connecticut River. Solids retained by the strainers are pumped for relatively economical waste treatment facility for Solids retained by the strainers are pumped for further treatment to the City of Montague's municipal sewage system. (Witt-IPC) W74-04534

BOISE CASCADE PAPER MILL AND ST. HELENS SHARE TREATMENT LAGOON. Industrial Wastes, Vol 18, No 2, p 14-15, March/April 1972. 2 illus.

Descriptors: *Lagoons, *Waste water treatment, Descriptors: "Lagoons, "Waste water treatment, "Pulp wastes, Treatment facilities, "Sewage treatment, "Columbia River, "Oregon, Pulp and paper industry, Biochemical oxygen demand, Waste treatment, Industrial wastes, Waste water(Pollution), Aerated lagoons, Anaerobic digestion, Aeration, Pollution abatement, Identifiers: Paper mills.

The pulp and paper mill of Boise Cascade Corp. at St. Helens, Oregon, recently started secondary treatment of waste waters in a new city-owned 40acre holding lagoon. The jointly financed, aerobic-anaerobic (facultative) basin also serves for secontreatment of the city's sewage. Th to the Columbia River through a concrete outfall pipe about 30 ft below the stream's summer water level. (Witt-IPC) W74-04535

CATALYTIC OXIDATION AND THERMAL WASTE OKISLENIE WATERS I TER-TREATMENT OF (KATALITICHESKOE MICHESKOE STOCHNYKH VOD), OBEZVREZHIVANIE

Gorkovskii Zavod Orgsintez (USSR).

S. P. Medvedev. Gidroliznaya i Lesokhimicheskaya Promyshlennost', No 3, p 28-29, 1973. 1 fig, 1 tab.

Descriptors: *Waste water treatment, *Industrial water, Cooling water, *Oxidation, Catalysts, *Chemical wastes, Treatment facilities, Pollution abatement, Waste water(Pollution), *Incineration, Burning, Chemical oxygen demand, Resins, Carbon dioxide, Steam, Evaporators, Organic loadnon duxine, steam, Evaporators, Organic loading, Inorganic compounds, Organic compounds, Chemicals, Chemical reactions, *Recycling. Identifiers: Rosin, Turpentine, Silvichemicals, Naval stores, Furnaces, Chemical reactors, Lacquers, Camphor.

Effluents from the processing of pinewood oleoresin to obtain naval stores (rosin and turpentine), and from the conversion of turpentine into camphor, oxyterpene resins, and related sil-vichemicals, are heavily polluted and contain up to 70,000 mg of COD/liter. Rosin and camphor factory effluent (75% by volume) is less polluted, but waste waters from the manufacture of nitro lacquers (25% by volume) have COD values up to 128,000 mg/liter. Direct and indirect incineration of these effluents in a gas-fueled cyclone combustion chamber produces carbon dioxide and steam which are cooled from 900-100 to 150-250 C in a vertical furnace where they serve to heat evaporator steam and burner air. The heated steam is passed to a reactor where its organic content is oxidized in contact with a catalyst. The purified steam can be recycled. Mineral impurities melted in the burner are collected separately. Cooling water in the entire factory amount to 95-98% of its water in the entire factory amount to 37-98% of its total freshwater consumption and is discharged without purification. Based on operating experience with the experimental effluent-treatment facilities, several suggestions for their improvement are presented. (Stapinski-IPC) W74-04537

STUDY OF PULP AND PAPER INDUSTRY'S EF-FLUENT TREATMENT. EKONO, Helsinki (Finland).

Report prepared for United States Federal Agriculture Organization Advisory Committee on Pulp and Paper, 13th Session, Rome, 15-16 May 1972. 74 p, 23 tab, 43 fig, 47 ref.

Descriptors: *Pulp wastes, *Bleaching wastes, "Waste water treatment, Costs, Economic feasi-bility, "Treatment facilities, Economic efficiency, "Econometrics, Cost-benefit analysis, Pulp and paper industry, "Cost analysis, Waste treatment, Industrial wastes, Pollution abatement, Color, water reuse, Water conservation, Regulation, Biochemical oxygen demand, Capital costs, Operating costs, Comparative costs, Suspended solids.

Estimates of engineering costs were prepared for liquid effluent treatments to meet various

specified purification levels. Based on capital and operating cost data for six mill case histories, major findings were as follows: Treatment costs and irrettly related to water quality requirements and regulatory enforcement. Primary treatment costs depend on efficiency of settleable solids removal and ultimate sludge disposal. BOD as a removal and ultimate sludge disposal. BOD as a water quality indicator also affects the secondary treatment cost which will double when desired BOD removal is raised from 85 to 90%. Tertiary treatment costs to remove 98% of 5-day BOD will be triple those for 85% removal. Kraft mill arges can be decolored to 50 color units by massive lime treatment of bleach plant effluents plus adsorption of total effluents on activated car-bon. Compared to 85% biological treatment, lime processing costs one-third; activated C about the same in capital but double in operating costs. As discharge regulations become more stringent, internal water conservation measures become more prevalent to reduce effluent volume through reduced freshwater intake. As much as 50% of treatment costs can be due to sludge disposal in mills providing 85% BOD removal plus sludge incineration. Major new developments aim at reducing pollutant discharges at their origin in the manufacturing flowchart. Minimization of treatment costs achievable by combined internal and external measures can vary with the final discharge objectives of any given mill. (Brown-IPC) W74-04538

1972 REVIEW OF THE LITERATURE ON PULP

AND PAPER EFFLUENT MANAGEMENT, National Council of the Paper Industry for Air and Stream Improvement, Inc., New York. G. Gove.

NCASI Stream Improvement Technical Bulletin, No 265, March 22, 1973. 66 p, 244 ref.

Descriptors: *Reviews, *Bibliographies, *Waste water treatment, *Pulp wastes, *Bleaching wastes, *Water quality control, Pulp and paper industry, United States, Byproducts, Recycling, Water reuse, Water conservation, Industrial wastes, Inreuse, water conservation, industrial wastes, industrial water, Color, Flotation, Coagulation, Biological treatment, Suspended solids, Oxidation, Sludge treatment, Activated sludge, Aerated lagoons, Irrigation, Ultimate disposal, Soil disposal fields, Treatment facilities, Economics, Pollutant identification, Water pollution sources, Instrumentation Water pollution sources, Instrumentation, Water analysis, Recycling, Conferences, Personnel, Ion exchange, Membrane processes, Effluents, Waste water(Pollution), Mu-nicipal wastes, Solid wastes.

This annotated survey of publications on the U.S. paper industry's water quality control and waste treatment progress during 1971/1972 deals with the following topics: Pollutant sources and receiving waters; analytical procedures (biological studies and instrumentation); disposal and recovery of spent pulping liquors (including membrane and ion-exchange processes, and recovery of cooking chemicals and by-products); physicochemical treatments (waste water renovation and reuse, solids removal, color reduction, chemical coagulation, flotation, oxidation and stripping, sludge han-dling); secondary treatments (activated sludge, aerated stabilization basins, land irrigation, mill treatment facilities, pilot and laboratory studies); waste paper and municipal refuse recycling; and general matters, such as national policies, techni-cal conferences, personnel, and treatment economics. (Witt-IPC) W74-04540

MERCURY REMOVAL FROM WASTE WATER WITH STARCH XANTHATE-CATIONIC POLYMER COMPLEX, Agricultural Research Service, Peoria, Ill. Northern Regional Research Lab.

C. L. Swanson, R. E. Wing, W. M. Doane, and C.

Environmental Scince and Technology, Vol 7, No 7, p 614-619, July 1973. 5 fig, 2 tab, 10 ref.

Group 5D—Waste Treatment Processes

Descriptors: *Mercury, Pollution abatement, *Waste water treatment, *Floculation, Waste water treatment, *Flocculation, *Chemical precipitation, *Polymers, Polyelectrolytes, Carbohydrates, Addities, Colloids, Zeta potential, Pollutants, *Cation exchange.

Identifiers: *Starch derivatives, Xanthates.

The sequential addition of starch xanthate and of a as poly cationic polymer, such (vinylbenzyltrimethylammonium polyethylenimine, to a solution of Hg(II) will polyetnylenimine, to a solution or fig(III) will precipitate both polymers and the Hg as a cohesive floc that can be readily filtered. Some xanthate groups on the C backbone of the starch macromolecule may form Hg(II) salts, while others react with the polycatin to form a polyelectrolyte complex. The amount of xanthate required to precipitate the Hg plus the cationic polymer can be determined by streaming current potential mea-surements. The effectiveness of Hg removal depends on the ratios of Hg to cationic polymer to xanthate. A single treatment reduced the Hg con-centration in a solution from 100,000 to as little as 3.8 microgram per liter. (Witt-IPC) W74-04541

ELECTROLYSIS AS A PURIFICATION METHOD FOR EFFLUENTS OF THE PULP AND PAPER INDUSTRY (DIE ELEKTROLYSE ALS REINIGUNGSVERFAHREN FUER AB-WAESSER DER PAPIER- UND ZELLSTOFFIN-

DUSTRIE), Technische Universitaet, Darmstadt (West Germany). Wasser- und Abwasserforschungsstelle.

W. Brecht, and H-L. Dalpke.
Das Papier, Vol 27, No 5, p 165-181, May 1973. 11 fig, 4 tab, 20 ref (English summary).

Descriptors: *Electrolysis, *Waste water treat-ment, *Pulp wastes, *Pollution abatement, Biochemical oxygen demand, Chemical oxygen demand, Pulp and paper industry, Treatment facilities, Organic wastes, Organic loading, Dissolved solids, Waste treatment, Foreign research.

The theory of electrolysis is reviewed. Laboratory and industrial-scale experiments on the electrolytic purification of effluents from two paper mills are reported, with emphasis on the effect of dissolved organic material on BOD. Evaluation of all results indicated that electrolysis is presently limited to a partial reduction of waste water BOD and possibly of COD, but does not achieve further effluent purification. (Wise-IPC) W74-04542

MILL'S WASTE WATER USED FOR SPRAY IR-

Descriptors: *Soil disposal fields, *Water reuse, Sprays, *Waste water disposal, *Pulp wastes, *Michigan, Pulp and paper industry, Industrial wastes, Waste disposal, Effluents, Irrigation, Costs, Operating costs, Capital costs, Maintenance, Soil physical properties, Permeability, Identifiers: Paper mills.

A waste water spray irrigation system built by Chemco Inc. of St. Joseph, Michigan, has been in-stalled on a 90-acre plot of Watervliet Paper Co. at an estimated project cost of \$1 million. Construction, operating, and maintenance costs of the system are expected to be lower than for more conventional effluent disposal plants. Open land and a highly permeable soil are required.
(McClenahan-IPC) W74-04543

SOLAR ENERGY FOR THE CONCENTRATION

OF PULP MILL EFFLUENTS,
Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Div. of Chemical Engineering.
B. W. Wilson.

Appita (Journal of the Australian and New Zealand Pulp and Paper Industry Technical Associa-tion), Vol 26, No 2, p 134-135, Sept. 1972. 4 ref.

Descriptors: *Pulp wastes, *Evaporation, *Solar Descriptors: "Pulp wastes, "Evaporation, "Solar radiation, "Solar distillation, "Waste water treatment, Ponding, Effluents, Waste treatment, "Australia, Pulp and paper industry, Weather. Identifiers: Spent pulping liquors, Black liquors, Eucalyptus trees, Concentrating(Thickness).

Because weather conditions in many parts of Australia permit large volumes of surface waters to be evaporated by solar energy, the application of this energy source to the concentration of organic matter and inorganic chemicals in aqueous pulp in-dustry effluents is suggested. In preliminary exdustry effluents is suggested. In preliminary ex-periments, spent liquors from the pulping of euca-lypts (by the kraft and neutral sulfite semichemical processes) were ponded and exposed for 90 days at Melbourne. Despite heavy rainstorms, exten-sive evaporation was noted. Rapid evaporation was also observed in laboratory studies, in which black liquors were exposed to infrared lamps (simulating solar energy). For industrial practice, partial solar evaporation might be followed and completed by conventional mill evaporators and ultimate incineration. (Wise-IPC) W74-04544

PHYSICOCHEMICAL PROCESSES WATER QUALITY CONTROL, Michigan Univ., Ann Arbor. Dept. of Civil En-

gineering.
W. J. Weber, Jr., J. A. Borchardt, R. P. Cavale, J.
L. Cleasby, and J. E. Couver.
Wiley-Interscience, New York, N.Y. 1972. 640 p.

Descriptors: *Water quality control, *Waste water treatment, *Pollution abatement, *Engineering education, *Water resources development, Water education, "Water resources development, Water chemistry. Treatment facilities, Coagulation, Flocculation, Chemical precipitation, Membrane processes, Filtration, Oxidation, Disinfection, Corrosion, Aeration, Sludge treatment, Sludge disposal, Ion exchange, Adsorption, Sedimenta-

In 12 chapters contributed by 9 experts this treatise develops rational foundations for the design, interpretation, implementation, and con-trol of physicochemical processes (not merely unit operatins) for achieving or mediating quality tranformations in natural waters, water supplies, and municipal and industrial waste waters. The text evolved from courses taught at the University of Michigan to advanced undergraduate and graduate students in environmental and water resources engineering, chemical and mechanial engineering, and chemistry. It seems also suited as a reference and/or refresher volume for practicing engineers and scientists involved with quality control. The introductory chapter deals with process dynamics, mechanics of mass transport, reaction kinetics and equilibria, reactor engineering, and process design. Subsequent chapters discuss coagulation and flocculation, sedimentation, filtration, adsorp-tion, ion exchange, membrane processes (reverse osmosis, ultrafiltration, electrodialysis), chemical oxidation (with oxygen, ozone, chlorine, perman-ganate, etc.), disinfection and disinfectants, corrosion and its control, aeration and gas transfer, and sludge treatment and disposal. Study problems (with approaches to solutions) and pertinent literature citations are given after each chapter. (Brown-IPC)

LIME DISINFECTION OF SEWAGE BACTERIA AT LOW TEMPERATURE.

Colorado State Univ., Fort Collins. Dept. of Microbiology. S. M. Morrison, K. L. Martin, and D. E. Humble. Copy available from GPO Sup Doc as EP1.23:660/2-73-017, \$1.25; microfiche from NTIS as PB-228 545, \$1.45. Environmental Protection Agency, Technology Service Report EPA-660/2-73-017, September 1973. 90 p, 33 fig, 18 tab, 81 ref. EPA Project 16100 PAK.

Descriptors: *Lime, *Sewage treatment, *Low temperature, *Sewage bacteria, *Disinfection, Calcium hydroxide, Alkali, Municipal wastes, Coliforms, Biochemical oxygen demand, Orthophosphate, Coagulation, Alaska, High altitude, Bioindicators, Hydrogen ion concentration, *Waste water treatment.

Identifiers: Excess lime treatment, Bacterial control

Small isolated communities in cold climate areas need a simple, inexpensive, reliable sewage system which includes disinfection. This laboratory study provides clarifying data on the action of lime as a sewage disinfectant at low temperatures. Nutrient level reductions were also studied. Lime was added to raw and activated sludge treated sewage to attain pH intervals between 10 and 12 at temperatures of 1, 5, 10 and 15C. Membrane filter procedures were used to follow decreases in total and fecal coliform populations and total plate counts at each test pH and temperature. In both sewages, it was observed that pH values above 11 were required to reduce coliform populations to levels below 100/ml in less than 8-12 hours. To attain coliform population reductions to 1/ml or less, 24 hours were required at pH 11 but only 90 minutes at pH 11.5. Coliforms and other organisms concentrated in the precipitated solids during lime treatment; their numbers decreased as pH and/or contact time increased. Temperature was a less significant factor in the disinfection mechanisms than was pH. An additional effect of lime treatment of sewage is the reduction of organic and inorganic chemical loads in the effluent. The reduc-tions at 15C for raw and 10C for secondary treated, measured by BOD and orthophosphate tests, reached maximum BOD removals of 77 and 94%, respectively, at PH 11 in 24 hours for raw and at pH 11.5 in 90 minutes for treated sewage. Likewise, maximum orthophasphate removals, 93 and 97%, respectively, were obtained at pH 12.0 for 60 minutes with raw and treated samples. (EPA) W74-04548

WASTE AUTOMOTIVE LUBRICATING OIL AS A MUNICIPAL INCINERATOR FUEL, GCA Corp., Bedford, Mass. GCA Technology

Div Available from GPO Sup Doc Copy EP1.23/2:73-293, \$1.05; microfiche from NTIS as BP-128 601, \$1.45. Environmental Protection Agency, Technology Series Report, EPA-R2-73-293, September 1973. 74 p, 9 fig, 9 tab, 54 ref. EPA Project 15080 HBO, Contract 68-01-0186.

Descriptors: *Oil wastes, Industrial wastes, *Waste treatment, *Incineration, *Air pollution, Identifiers: *Refuse combustion, Heat flux.

The technical, economic and environmental impact of utilizing waste automotive lubricating oils to improve the municipal incineration combustion process was examined. Laboratory analyses of selected physical properties of waste oil waste oil burner testing program were conducted to complement an information search program. The physical and chemical properties of waste oil were reviewed in relation to its suitability as a fuel oil. The auxiliary fuel heat flux requirements to offset the adverse effects of wet refuse were esti-mated utilizing a combustion model of a refuse bed. Various methods were evaluated for transferring this required heat flux to the refuse bed. Suggested design for monitoring and control; and gested design for monitoring and control; and waste oil storage and feed systems were presented. The impact on air quality from the com-bustion of waste oil in a municipal incinerator was estimated. Three-month average ground level con-centrations for lead were calculated and presented as concentration isopleths. Capital investment and

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Waste Treatment Processes—Group 5D

operating costs were developed for auxiliary waste oil systems in conjunction with municipal incinerators. (EPA) W74-04549 (EPA)

PROCESSES ON ALGAL GROWTH, California Univ., Irvine. For primary bibliographic entry see Field 5C. W74-04552

200 MGD ACTIVATED SLUDGE PLANT REMOVES PHOSPHORUS BY PICKLE LIQUOR,
Milwaukee Sewerage Commission, Wis.

R. D. Leary, L. A. Ernest, R. S. Powell, and R. M.

Copy Available from GPO Sup Doc as EP1.23:670/2-73-050, \$1.50; microfiche from NTIS as PB-228 561 \$1.45. Environmental Protection Agency Technology Series Report EPA-670/2-73-050, September 1973. 127p, 34 fig, 9 tab, 39 ref. EPA Project 11010 FLQ.

Descriptors: *Activated sludge, *Biological treat-ment, Chemical precipitation, *Iron, Phosphorus, *Wisconsin, *Waste water treatment, Sulfates. Identifiers: *Phosphorus removal, Milwaukee(Wis), *Pickle liquor, Ferrous sulfate.

The Milwaukee Sewerage Commission's Jones Island Waste Water Treatment Plant consists of a Island Waste Water Treatment Plant consists of a mutual primary treatment facility followed by two separate activated sludge plants. To enhance phosphorus removal in the 115 MGD East Plant, hot spent sulfuric acid pickle liquor (ferrous sulfate) was added for a one year test period in 1970 while the 85 MGD West Plant was operated as a control. This follow up report covers the 1971 operational period in detail and the first four months in 1972. An average of 8.0 mg, Fe/1 of pickel liquor iron (8436 lbs. Fe/day) was added in 1971 to the East Plant mixed liquor, producing an effluent total phosphorus concentration of 0.69 mg P/1 and a total soluble phosphorus concentration of 0.15 mg P/1. This performance is based upon a raw screen sewage total and total soluble phosphorus concentration of 7.1 and 2.3 mg P/1, respectively. In an attempt to enhance phosphorus respectively. In an attempt to enhance phosphorus removal in the West Plant, East Plant waste sludge containing a higher iron content was added to the West Plant return sludge starting in April 1971. This procedure increased the iron content of the Plant but did not substantially increase the west Plant phosphorus removal. During the 12 month period from May 1971 to April 1972, the West Plant effluent total and total soluble phosphorus concentrations averaged 1.5 and 0.64 mg P/1, respectively. (EPA) W74-04554

ALLOCATION OF FUNDING FOR WASTE-WATER TREATMENT FACILITIES, Colorado State Univ., Fort Collins. Dept. of Civil Engineering. J. S. Hunter, III.

Journal Water Pollution Control Federation, Vol 46, No 1, p 18-27, January 1974. 3 fig, 17 ref.

Descriptors: *Water pollution control, *Waste water treatment, *Treatment facilities, *Cost-benefit analysis, *Project benefits, *Systems analysis, Mathematical models, Administration, Optimization, Estimating, Evaluation, Welfare(Economics).
Identifiers: *Funding(Allocation).

Priority systems developed by state administrative authorities to allocate federal wastewater treat-ment plant construction grant funds contain deficiencies and have been ineffective in directing this money to the most beneficial projects. A benefit-cost ratio approach to fund allocation is preposed that overcomes many of the shortcomings of cur-rent procedures. Systems analysis techniques are

presented that can be used to obtain the necessary full and flexible consideration of all possible alter-native funding combinations. Of particular interest is the development of a benefit estimation technique which can be used for evaluating water pollution control projects. The technique can be considered an optimization procedure, in this case for finding the mix of treatment facilities that maximizes benefits within a given budget constraint. Interdependencies among the four dimensions of the water resource (time, quantity, location, and quality) and the various uses to which the water resource can be put are taken into account. More attention must be given to the actual benefits obtained from water quality management projects. (Bell-Cornell) W74-04562

WATER QUALITY IMPROVEMENT IN RIVER SINS (EXPERIENCE OF INDUSTRIALIZED COUNTIRES) (O POVYSHENII KACHESTVA VODY V RECHNYKH BASSEYNAKH (OPYT INDUSTRIAL'NYKH STRAN)), For primary bibliographic entry see Field 5G. W74-04583

WHAT'S WRONG WITH GOVERNMENT WATER CONTROL PROGRAMS AND HOW THEY CAN BE IMPROVED, Georgia COIL, Milledgeville. Dept. of Business Ad-ministration and Economics.

R. M. Piper.

Paper Trade Journal, Vol 157, No 12, p 31-33, March 19, 1973, 2 tab.

Descriptors: *Pulp and paper industry, *United States, Surveys, *Federal government, *Water quality control, *Legal aspects, *Regulation, Water policy, Project planning, Economics, quality control, "Legal aspects, "Regulation, Water policy, Project planning, Economics, Capital costs, Waste water treatment, Biological treatment, Ecology, Economic prediction, "Water quality standards, Administration, Pollution abatement Planning Person Property Planning Person Perso ment, Planning, Research priorities.
Identifiers: Incentives, Economic incentives.

An opinion survey of the U.S. paper industry regarding water quality legislation was conducted in 1971. Results indicated that the percentage of in-dustry effluents receiving secondary treatment would rise from 16% in 1965 to 96% in 1975, and that industrial expenditures for pollution abate-ment facilities would increase from 6% of total plant and equipment investments in 1965 to ca. 18% in 1975. Reported discontent with governmental water control programs is discussed in the areas of water quality standards, intergovernmental relations, environmental planning, and economic problems. Suggestions for existing program improvement (rather than for new legislation) are made in the sectors of environment planning water standards, economic incentives and research needs. A better balance between ecological goals and economic sacrifices is urged. (Witt-IPC) W74-04632

HYPOCHLORINATION OF POLLUTED STORM-WATER PUMPAGE AT NEW ORLE-

Pavia-Byrne Engineering Corp., New Orleans, La. U. R. Pontius, E. H. Pavia, and D. G. Crowder. Copy Available from GPO Sup Doc as EP1.23:670/2-73-067, \$1.95; microfiche from NTIS as PB-228 581, \$1.45. Environmental Protection Agency, Technology Series Report, EPA-670/2-73-067, September 1973. 188 p, 53 fig, 23 tab, 33 ref. EPA Project 11023 FAS.

Descriptors: *Disinfection, *Chlorination, *Water pollution treatment, *Treatment facilities, *Storm runoff, Coliforms, Operation and maintenance, Plastic pipes, Oxidation-reduction potentials, Cenriaste pipes, Concrete lined canals, Protection coatings, Sodium compounds, Storage tanks, *Louisiana, *Waste water treatment. Identifiers: *Hypochlorination, hypochlorite manufacturing facilities, Lined steel storage tanks, New Orleans, Hypochlorite feeding facilities, Residual chlorine analyzers.

Storm water from the streets of New Orleans flows to large drainage pumping stations where it is discharged into lake Pontchartrain by means of long outfall canals. To reduce the coliform density, storm water was disinfected with sodium hypochlorite (NaOCl). Project facilities included manufacture, transportation, storage and feeding of 100 gram/1 NaOC1. Residual chlorine analyzers of 100 gram/I NaOC.I. Residual chlorine analyzers were used to monitor NaOCI dosage levels. Sixteen high volume storms totaling 10 to the 9th power gal. of storm water were treated with more than 35,000 gal. of NaOCI. Total and fecal coliform in untreated storm water exceeded 1000 org/100 ml, 99% of the time. Coliform densities in org/100 ml, 99% of the time. Coliform densities in reated water were significantly reduced, with chlorine residuals (total available) of greater than 0.5 mg/l resulting in 99.99% or greater removal. However, rapid recovery of coliform levels occurred within 24 hours. Total coliform recovered to pre-disinfection levels, but fecals did not. The recovery did not appear to be the result of tidal influences. Long term fecal coliform levels were . Long term fecal coliform levels were reduced by one order of magnitude in each outfall canal. The amortized cost of NaOCl manufacturing, transporting, feeding and control facilities was \$53,600/yr. NaOCl costs for treating 5 times 10 to the 10th power gal. of storm water yearly were \$200,300. This resulted in a treatment cost of \$.000051/gal. (EPA) W74-04676

SURVEY OF FACILITIES USING LAND APPLI-CATION OF WASTEWATER, American Public Works Association, Chicago, Ill.

R. H. Sullivan, M. M. Cohn, and S. S. Baxter. R. H. Sullivan, M. M. Conn, and S. S. Daxler.
For sale by the Superintendent of Documents, U.
S. Government Printing Office, Washington, D.C.
20402 Price \$6.80. Environmental Protection
Agency, Office of Water Program Operations, Report EPA-430/9-73-006, July 1973, 377 p. 23 fig, 98

Descriptors: *Water reuse, *Land management, Descriptors: "Water reuse, "Land management, *Treatment facilities, Surveys, "Water spreading, Waste disposal, "Waste water disposal, Domestic wastes, Industrial wastes, "Waste water treat-ment, Tertiary treatment, Land use, Zoning, Monitoring, Water pollution, Soil types. Identifiers: "Land application(Waste water), *Spray irrigation, Waste water transport.

A field survey was made of 100 major facilities where land applications of domestic or industrial wastewater effluents were utilized; agricultural wastes facilities and evaporation-percolation or spray runoff type facilities were not investigated. application systems are generally used seven Land application systems are generally used seven days per week; application rates for crop irrigation are generally about two inches per week (54,300 gallons per acre per week). Sand, loam and silt were the most common soil types. Industries generally treat their total waste flow by land appli-cation; municipalities varied from less than 25 per-cent to all of the wastewaters discharged. Seconcent to all of the wastewaters discharged. Secondary treatment, generally lagooning, is provided by municipalities prior to land application; industries frequently treat their process wastes by screening only. Spray irrigation is the most frequently used method of application (57 facilities) mainly by industries. Ridge and furrow irrigation is used at 23 facilities and flooding irrigation by 34 systems. Land use zoning for land application sites is predominantly classified as farming, with some residential zoning in contiguous areas. Wastewater generally is transported to the application site by pressure lines, although some mution site by pressure lines, although some mu-nicipalities utilize ditches or gravity flow pipe lines. More than half of the community land appli-cation facilities have been in use for more than 15 years; industrial systems for a lesser period of time. Renovated wastewater is seldom collected by underdrains; rather, evaporation, plant trans-

Group 5D—Waste Treatment Processes

piration, and groundwater recharge take up the flow. Monitoring of groundwater quality, soil contaminants, crop uptake, and surface water is not carried out with any consistency. W74-04677

PROCESSES FOR REDUCING THE ORGANIC-CARBON CONTENT OF WATER CON-TAMINATED WITH ORGANIC COMPOUNDS CONTINUOUS COUNTERCURRENT MULTISTAGE TREATMENT TIVATED CARBON, Environment WITH

Environmental Protection Agency, Washington,

D.C. (Assignee).

W. G. Timpe, and E. W. Lang U.S. Patent No. 3,763,040, 5 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office. Vol 915, No 1, p 274, October 2, 1973.

Descriptors: *Patents, *Waste water treatment, *Organic compounds, *Activated carbon, *Pulp wastes, Pulp and paper industry, *Industrial Pollution abatement, Water pollution control, Water quality control.

The process for reducing the organic-carbon content of contaminated water comprises subjecting tent of contaminated water comprises subjecting the water to a continuous countercurrent multistage treatment with particulate activated carbon in several tanks. A high slurry density is maintained in each tank. The slurry is stirred con-tinuously and portions free of solid particles are withdrawn and transferred into a consecutive tank of the series. The activated carbon particles have sizes between 104 and 250 microns. Fresh activated carbon particles are continuously charged into the last of the series of tanks or stages at a dosage or rate such that the total organic-carbon content of the incoming contaminated water is reduced to the preselected value. The spent carbon particles are withdrawn from the first of the tanks or stages in series at substantially the same rate as fresh activated carbon is charged to the last tank or stage. The tanks or stages are connected in such manner that the water can flow or be charged continuously from the first to the last tank or stage of the series and portions of the water containing dispersed carbon particles that are undergoing treatment in each of the tanks or stages can be withdrawn and charged countercurrently to the flow of the water from each tank to a preceding tank or stage in the series. Each tank or stage is provided with screens or baffles which create a clarification zone that retains or holds back carbon or other solid particles that are dispersed in the slurry and permits the treated water to flow out of the tank or stage to the next, or out of the last tank or stage, as a clear liquid essentially free of suspended carbon or other solid particles. (Sinha-W74-04704

WATER PURIFICATION. For primary bibliographic entry see Field 5F. W74-04706

APPARATUS FOR TREATING INDUSTRIAL AND DOMESTIC WASTE WATERS Westinghouse Electric Corp., Pittsburgh, Pa. (Assignee).

U.S. Patent No. 3,774,768, 5 p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 916, No 4, p 1360, November 27, 1973.

Descriptors: *Patents, *Biochemical Oxygen Demand, *Industrial wastes, *Domestic wastes, *Waste water treatment, *Oxygenation, Pollution abatement, Water quality control, Water pollution

A system is described for removing BOD from waste water. A single containment structure incorporates a surge aeration tank and a system for transferring oxygen to a liquid which is circulated through a contact section to establish contact of the oxygen containing gas-suspended solids--liquid mixture. The structure maximizes the oxygen utilization within the system while simultaneously generating small air bubbles to achieve great effi-ciency and rapid removal of the BOD. The system for treating waste waters includes a pair of con-centric tanks forming a space which serves as an aeration chamber. Untreated but screened waste water is discharged into the space and withdrawn from it by a pump which passes the liquid through an oxygenating device which induces air into the liquid. The liquid is then circulated through long tubing wound around the outside peripheral sur-face of the tank to obtain intimate contact between the gas, liquid and solids therein and to convert dissolved material into insoluble material by a con-ventional biochemical process. The liquid thus processed in the tubing is introduced into the central or inner tank where the treated solids rise to the surface for recycling in the system while the liquid effluent is filtered and discharged to a river or stream. (Sinha-OEIS) W74-04707

SEDIMENTATION TANKS,

British Wedge Wire Co. Ltd., Warrington (England), (Assignee). . Sparham, and G. F. Pinner. U.S. Patent No. 3,774,770, 5 p, 6 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 916, No 4, p 1361, November 27, 1973

Descriptors: *Patents, *Waste water treatment, *Sedimentation, Equipment, *Filtration, Pollution abatement, Water pollution control, Water quality

Identifiers: *Settling tanks.

A sedimentation tank for liquid purification has a submerged horizontal filtering screen for purifying passing upward through it and a scraping mechanism for scraping sludge from the bottom of the tank towards a sludge outlet. The filtering screen extends across the greater part of the interi-or of the tank, the zone above it being partitioned from an adjoining zone through which extends downwardly a transmission element drivably con-necting the scraping mechanism to an outside power source. (Sinha-OEIS) W74-04708

METHOD AND APPARATUS FOR THE BIOLOGICAL TREATMENT OF WASTE WATER, Autotrol Corp., Milwaukee. Wis. Bio-Systems

Div. (Assignee). W. N. Torpey.

U.S. Patent No. 3,776,841, 4 p, 5 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 917, No 1, p 286, December 4, 1973.

Descriptors: *Patents, *Waste water treatment, *Biological treatment, Suspended solids, Pollution abatement, Water pollution control, Water quality

Identifiers: Settling, *Carbonaceous wastes.

Forcibly rotating bodies that are partially sub-merged in waste water provide surface area on which biological slimes develop and serve the purwhich biological stimes develop and serve the pur-pose of removing pollutants from the waste water. The rotating, partially submerged bodies are located in the upper portion of the treatment tanks, to provide a biological treatment zone. A subjacent settling zone, physically separated from the biological treatment zone by a 'false bottom' or longitudinal baffle is provided in the lower portion of the treatment tank. Waste water introduced in the tank is first biologically treated and then cir-culated through the subjacent settling zone to recover settleable solids. Virtually all, usually 100% of the biologically treated waste water is forced through the subjacent settling zone which, because of its physical separation from the rotat-ing contactors is quiesent and capable of a high

removal of suspended solids. The improved anparatus and method result in a consistent removal of carbonaceous pollutants from the waste water with a minimum spillover of suspended solids thereby eleiminating the neef for subsequent solids removal apparatus. (Sinha-OEIS)

SCREENING AERATOR CONCENTRATOR,

SCREENING AERATOR CONCENTRATOR, Sweco, Inc., Los Angeles, Calif. (Assignee). P. H. Mook, and T. R. Westfall. U.S. Patent No. 3,775,311, 4 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 916, No 4, p 1493, November 27, 1973.

Descriptors: *Patents, *Waste water treatment, *Aeration, *Aerators, Equipment, *Froth flotation, Pollution abatement, Water pollution control, Water quality control.

The apparatus comprises a fine mesh rotating screening aerator combined with a froth flotation system. Although the rotating screen separator by its very nature creates a certain amount of froth, this frothing ability can be enhanced by this invention which adapts such separators to make use of their aerating capability. The frothing potential may be enhanced by various methods. One is to in-troduce a stream of air into the influent just before it passes into the rotating screen separator. Another is to add a series of vanes on the rotating screen cage to increase air circulation. Such methods of adding air, or ensuring an adequate supply of air into the apparatus, enable an increase in the dissolved oxygen which enhances the life-sustaining and aerobic digestion qualities of the ef-fluent. (Sinha-OEIS) W74-04712

METHOD AND APPARATUS FOR TREATING

EFFLUENT,
Mono Pumps (Engineering) Ltd., London
(England). (Assignee). A. P. Hopwood.

U.S. Patent No. 3,773,660, 3 p, 2 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 916, No 3, p 1051, November 20, 1973.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, Equipment, *Pollution abatement, *Water pollution control, *Water quality

A method of treating raw sewage consists of the steps of macerating the effluent, passing it to a vessel containing submerged contact media and passing air through the vessel and the effluent is fed into the lower region of the vessel. Biologically purified effluent can leave the top of the vessel and pass to a suitable settlement tank and the sludge can be separated for treatment in a sludge treatment vessel. The effluent from the settlement treatment vessel. The effluent from the settlement tank can be passed to at least one more stage wherein the above steps, with the exception of maceration, are repeated. The effluent can, alternatively, be passed from the first vessel to a second vessel and then to a settlement tank. (Sinha-OEIS) W74-04714

PROCESS FOR PURIFYING WATER THAT CONTAINS ORGANIC MATTER, Kurita Water Industries Ltd., Osaka (Japan).

(Assignee). Y. Misaka, M. Kuriyama, and T. Mukai.

U.S. Patent No. 3,763,038, 5 p, 1 fig, 9 tab, 3 ref; Official Gazette of the United States Patent Office, Vol 915, No 1, p 273, October 2, 1973.

Descriptors: *Patents, Pollution abatement. *Waste water treatment, *Organic matter,
*Flocculation, *Coagulation, Microorganisms,
Iron, *Aeration, Water purification, Sedimenta-

Identifiers: Ferric salts, Ferrous salts, Oxidants.

The process comprises a series of treatment steps of mixing coagulants consisting of either a ferric salt alone or a ferrous salt and an oxidant into the sewage. The sewage is agitated to stimulate floc formation and growth. In a sedimentation section separation of effluent and sludge takes place. The effluent is introduced into an aeration tank where iron floc is formed and the microorganisms are adsorbed on the flocs. (Sinha-OEIS)
W74-04716

METHOD OF TREATING SEWAGE USING HIGH POLYMER RATIO FLOCCULATION AGENT BIOLOGICALLY PRODUCED IN SITU, Houdaille Industries, Inc., Buffalo, N.Y. (Assignee). G. E. Wilson

U.S. Patent No. 3,763,039, 12 p, 9 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 915, No. 1 p 273, October 2, 1973.

Descriptors: *Patents, Polymers, Microorganisms, *Flocculation, *Suspended solids, *Sewage treatment, *Activated sludge, Pollution abatement, *Waste water treatment, Water quality control, Water pollution control.

A high polymer ratio flocculation agent is inswage treatment plant. The floculation agent is introduced into raw sewage to remove colloidal suspended solids in the primary clarifier of a sewage treatment plant. The floculation agent comprises at least 10 percent by dry weight biologically derived polymeric material and can be derived in situ from microorganisms that are composite for the state of t derived in situ from microorganisms that are com-monly found in an activated sludge process. The flocculation agent is produced by subjecting microorganisms capable of generating polymeric material to a high flood content environment in an aeration tank into which supernatant from the pri-mary clarifier is delivered and then subjecting the microorganisms to a low food content environment, as a consequence of which polymeric material is generated through the extracellular activity of the microorganisms. (Sinha-OEIS) W74-04717

APPARATUS FOR TREATING WASTE FLUIDS BY MEANS OF DISSOLVED GASES, Pollution Control Engineering, Inc., Downey, Calif. (Assignee).

G. E. Hurst. U.S. Patent No. 3,773,179, 4 p, 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 916, No 3, p 932, November 20, 1973.

Descriptors: *Patents, Flotation, Gases, *Waste water treatment, *Pollution abatement, *Water pollution control, *Water quality control. Identifiers: *Dissolved gases.

Water to be treated is pumped a number of times from different compartments of a floatation tank. The flow of water can be relatively smaller and at each pumping operation more gas can be injected into the flow so that more gas is forced into solu-tion than could be obtained with a large flow through a single pump. The discharge into each through a single pump. The discharge into each tank compartment is confined to a relatively small area as well and then is discharged against a deflector plate which actually scrubs the oil or suspended matter out of the waste water. The oil or suspended matter which is caused to float in each compartment is then removed from the surface either by a continuous belt skimmer, by passing it over a weir or using a moving skimmer arm and the clarified water is removed from the bottom of the final compartment. In the first com-partment fluid is withdrawn, gas is injected into the flow, and then it is returned to the same comthe flow, and then it is returned to the same com-partment and discharged against a deflector plate. A second pump takes fluid from the first compart-ment and discharges it into the second compart-ment and a third pump takes fluid from the second compartment and discharges it into the third com-partment. At the point of gas injection, flocculent materials can also be introduced if necessary. (Sinha-OEIS) W74-04719

TRICKLING FILTER-ACTIVATED SLUDGE COMBINATIONS FOR DOMESTIC WASTE-WATER TREATMENT,

Rieke, Carrol, Muller Associates, Inc., Hopkins,

R. F. Roskopf, J. C. Young, and E. R. Baumann. R. F. ROSKOPI, J. C. YOUNG, and E. R. Baumann. Available from NTIS, Springfield, Va. 22151 PB-221 090 for \$3.00 printed copy; \$1.45 microfiche. Iowa State University Engineering Research In-stitute Special Report 73107, May 1973. 203 p, 42 fig, 7 tab, 89 ref, 3 append.

Descriptors: "Waste water treatment, "Trickling filters, "Iowa, Sewage treatment, Activated sludge, Municipal wastes, "Sludge treatment. Identifiers: "Ames(Iowa).

The feasibility of using a new activated sludge process in series or parallel with an existing trickling filter was studied as a means of upgrading and/or expanding the capacity of a domestic wastewater (Ames, Iowa primary settling tank effluent) was used throughout the study as pilot plant influent. Both biological pilot units performed typically when used as first-stage units. Pilot trickling filter performance was dessentially the same as that of the Ames trickling filters. the same as that of the Ames trickling filters. Second-stage unit performance was dependent upon first-stage performance, and warm weather nitrification was obtained with the TF-A process. All three combinations had potential for economically providing a high quality final effluent, although both series processes seemed to have performance advantages over the parallel process. With approximately equal volumes of aeration tank and trickling filter, the overall performance of each series combination was essentially equal to up greater than the performance of an equally of each series combination was essentially equal to or greater than the performance of an equally loaded activated sludge process. The parallel process provided a greater overall performance than could be obtained by combining the effluents from parallel but separate activated sludge and trickling filter plants. The existing Ames plant could be economically upgraded and expanded with a series TF-A process having the flexibility of parallel operation when so desired. (Knapp-USGS) USGS) W74-04798

OZONIZATION AS A METHOD OF PURIFYING WATER POLLUTED WITH CHEMICAL COM-POSITION, (IN RUSSIAN), Moskovskii Gosudarstvennyi Meditsinskii Institut

(I) (USSR).

A. A. Korolev

Gig Sanit. 37(12): p 78-83. 1972. Identifiers: Chemical compounds, *Ozonization, Polluted waters, *Water purification, *Public health, *Waste water treatment.

The use of ozone for purifying water and industrial waste polluted with chemical compounds should be studied constantly by hygienists. Investigators have concentrated on an evaluation of the quantitative aspect of the problem of ozonization (the degree of decomposition of various substances, the magnitude of the bactericidal effect, etc.). The qualitative biological aspect of ozonization was not reported. The need for such investigations was dictated by the increasing use of ozone for water treatment and waste purification.—Copyright 1973, Biological Abstracts, Inc. W74-04836

5E. Ultimate Disposal Of Wastes

WATER SUPPLY AND WASTE DISPOSAL CONCEPTS APPLICABLE IN PERMAFROST

Alaska State Dept. of Environmental Conserva-For primary bibliographic entry see Field 5D.

W74-04405

A HISTORY AND PRELIMINARY INVENTORY REPORT ON THE KENTUCKY RADIOACTIVE WASTE DISPOSAL SITE,

WASTE DISPOSAL SITE, Kentucky Dept. of Health, Frankfort. Radiologi-cal Health Program. For primary bibliographic entry see Field 5B. W74-04442

DISPOSAL OF RADIOACTIVE WASTES, Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii SSSR, Moscow. For primary bibliographic entry see Field 5D. W74-04445

INDUSTRY AWAITS SOLUTIONS TO PROBLEMS OF HIGH-LEVEL RADIOACTIVE-WASTE MANAGEMENT, For primary bibliographic entry see Field 5D. W74-04457

LAND DISPOSAL OF WASTE GASES: 1. FLOW ANALYSIS OF GAS INJECTION SYSTEMS, Arizona Univ., Tucson. Dept. of Soils, Water and

Engineering. S. Miyamoto, A. W. Warrick, and H. L. Bohn. Journal of Environmental Quality, Vol 3, No 1, p 49-55, January-March 1974. 8 fig, 2 tab, 17 ref.

Descriptors: *Waste disposal, *Soil disposal fields, *Gases, Permeability, Soil chemical properties, Soil physical properties, Diffusion, Seepage. Identifiers: *Waste gas disposal, Air pollution con-

The steady-state flow of gases in soils was analyzed mathematically from the view of land disposal of waste gases. Gas injection systems considered include ditches, buried pipes, and wells. The systems are compared on the basis of two criteria: how effectively the power is used convex efficiency. (power efficiency); and how uniformly the gas is distributed through soils (uniformity). Often the distributed through solis (unnormity). Often the two criteria are in conflict, and systems giving a high power efficiency result in low uniformity. Gas injection by buried porous pipe appears advantageous over dicth or well systems. (See also W74-04480) (Knapp-USGS) W74-04479

LAND DISPOSAL OF WASTE GASES: II. GAS FLOW FROM BURIED PIPES.

Arizona Univ., Tucson. Dept. of Soils, Water and

Engineering.
A. W. Warrick, and S. Miyamoto.
Journal of Environmental Quality, Vol 3, No 1, p
55-60, January-March 1974. 8 fig, 1 tab, 5 ref.

Descriptors: *Waste disposal, *Soil disposal fields, *Gases, Permeability, Soil chemical properties, Soil physical properties, Diffusion, Seepage. Identifiers: *Waste gas disposal, Air pollution con-

Steady-state compressible gas flow in homogeneous soils from buried porous pipes was analyzed for the purpose of developing land disposal systems for waste gases. Two different cases are considered: the ground surface partially covered by an impermeable barrier; and the surface corruoy an imperimental partial state of the pipe buried under the ridges. The partial surface barrier provides a more uniform gas flow in soils than without it, but leads to an increase in the power required to inject gas at a given rate, expecially when the pipe spacings are wide. Compared to an open level surface, the corrugated geometry results in a better gas distribution with little in-crease in power required and is probably the better system for injecting waste gas in nonstratified soils. (See also W74-04479) (Knapp-USGS)

Group 5E—Ultimate Disposal Of Wastes

PAPER MILL SLUDGE DISPOSAL ON SOILS: EFFECTS ON THE YIELD AND MINERAL NUTRITION OF OATS (AVENA SATIVAL.), Wisconsin Univ., Madison. Coll. of Agricultural and Life Sciences.

S. G. Dolar, J. R. Boyle, and D. R. Keeney. Journal of Environmental Quality, Vol 1, No 4, p 405-409, 1972. 6 tab, 16 ref.

Descriptors: *Sludge disposal, *Soil disposal fields, *Pulp wastes, Agronomic crops, *Oats, Waste water treatment, Nutrients, *Nitrogen compounds, *Fertilizers, Ultimate disposal, Waste disposal, Cereal crops, Plant growth, Trace elements, Soild wastes.

Sludge from paper mill effluents was mixed with soil in amounts of 2.5 or 10% (based on dry weight of the soil), and the effects of these mixtures on the growth of planted oats were investigated. Sludges from secondary treatment processes contained sufficient amounts of nitrogen, namely, nitrogen to organic carbon ratios of 1:12 to 1:50, and did not interfere with plant growth, whereas sludges from primary effluent treatments were deficient in N. High sludge concentrations inhibited plant growth, probably by affecting the uptake of Cu, Al, Fe, Zn, Mn, and similar trace elements. (Witt-IPC)

MILL'S WASTE WATER USED FOR SPRAY IRRIGATION.

For primary bibliographic entry see Field 5D. W74-04543

HYDROGEOLOGIC CONSIDERATIONS IN SOLID WASTE STORAGE IN IOWA: PART 1. SANITARY LANDFILL SITE SELECTION: PART 2. A METHOD OF HAZARDOUS AND TOXIC WASTE DISPOSAL,

Geological Survey, Iowa City, Iowa. S. J. Tuthill, D. L. Gordon, and F. H. Dorheim. Public Information Circular No 4, September 1972. 59 p, 18 fig, 2 tab, 3 ref, append.

Descriptors: *Landfills, *Waste disposal wells, *Iowa, *Hydrogeology, Water law, *Regulation, Garbage dumps, Industrial wastes, Municipal wastes, Water pollution control.

In regions of low-density population, such as Iowa, a sanitary landfill that is precisley engineered and properly managed appears to be the most satisfactory solution for disposing of solid waste. Site selection is a question of first importance to the initial and long-range success of any landfilling operation. The requirements of the Iowa Code with respect to landfill site selection are discussed and geologic criteria that pertain to these rules are explained. Guidelines are discussed that indicate types of earth and rock conditions in Iowa that would tend to safeguard water resources. Where a less favorable site has to be used because of other constraints, suggestions are made that may assist the responsible community agency to make necessary modifications to protect he regional water supplies. Toxic-waste disposal in shale terrane is feasible by storing these waste fluids in drums within vertical shale storage shafts bored in essentially impermeable rock units. The shale storage shafts would be bored to depths limited only by the thickness of the rock unit and would accommodate a series of steel drums stacked in the holes. A minimum thickness of 30 feet of the same undisturbed shale should extend below any given storage shaft. The rock unit in which the shafts are excavated should be unjointed, unfractured, unfaulted, and nonfissile. (Knapp-USGS)

HYDROLOGIC AND GEOLOGIC CONSIDERA-TIONS FOR SOLID-WASTE DISPOSAL IN WEST-CENTRAL FLORIDA,

Geological Survey, Tallahassee, Fla.

J. W. Stewart, and A. D. Duerr. Water-Resources Investigations 50-73, October 1973, 52 p. 36 fig. 17 ref.

Descriptors: *Landfills, *Garbage dumps, *Hydrogeology, *Path of pollutants, Water pollution sources, Groundwater movement, *Florida, Water pollution control, Planning, *Solid wastes, *Waste disposal.

Hydrogeologic studies are a prerequisite to selecting landfill sites in the karst topography of west-central Florida to minimize water pollution problems. Much of the area is low, poorly drained, and the water table is near land surface. Preparation of selected sites usually will require the construction of trenches with dikes to facilitate dewatering, extra pumps for dewatering during high intensity rainfall, and construction of oxidation ponds for retaining water pumped directly from active trenches, prior to discharging water out of the area. A water-quality network is also established to monitor the effects of solid waste on the water resources of an area. The report contains 73 photographs that illustrate the various operations of solid-waste disposal, beginning from the initial investigation of a site to final burial of solid waste in a trench. (Knapp-USGS)

5F. Water Treatment and Quality Alteration

AN ASSESSMENT OF THE USE OF POTOMAC ESTUARY WATERS AND AWT EFFLUENTS FOR EMERGENCY WATER SUPPLY, Meta Systems, Inc., Springfield, Va. For primary bibliographic entry see Field 5D.

HYPOCHLORINATION OF POLLUTED STORM-WATER PUMPAGE AT NEW ORLE-

ANS, Pavia-Byrne Engineering Corp., New Orleans, La. For primary bibliographic entry see Field 5D. W74-04676

WATER PURIFICATION,

W74-04506

N. A. Starke.
U.S. Patent No. 3,776,524, 3 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 917, No 1, p 211, December 4, 1973.

Descriptors: *Patents, *Water purification, *Filtration, Water quality control, Water pollution control, Pollution abatement, *Chlorination, *Waste water treatment, *Water treatment.

This invention relates to the chlorination of water for the purposes of sterilizing the water and more particularly the invention relates to the chlorination of water by means of gaseous chlorine produced in an electrolytic cell. It consists of a mixing chamber in which gaseous chlorine is mixed with water. The chamber has a float controlled inlet and an outlet dipping below the water level established by the float controlled valve. At a position above the water level there is an orifice and a chlorine gas inlet. The orifice limits the negative pressure in the chlorine gas inlet when water passes through the orifice under suction applied to the outlet. There is also provided a water filtering system wherein a supply of water under pressure is connected to the liquid inlet of the mixing chamber. The supply of chlorine gas is connected to a water pipe associated with the filter system, such that a negative pressure is applied to the outlet in operation. (Sinha-OEIS) W74-04706

PROBLEM OF ISOLATING SALMONELLA FROM SURFACE WATERS EXEMPLIFIED BY

LONG-TERM STUDIES IN THE BERLIN AREA, CAPITAL OF THE GERMAN DEMOCRATIC REPUBLIC, (IN GERMAN), For primary bibliographic entry see Field 5A. W74-04835

OZONIZATION AS A METHOD OF PURIFYING WATER POLLUTED WITH CHEMICAL COMPOSITION, (IN RUSSIAN), Moskovskii Gosudarstvennyi Meditsinskii Institut (I) (USSR).

(I) (USSR).
For primary bibliographic entry see Field 5D.
W74-04836

HYGIENIC EFFICIENCY OF MEASURES FOR PROTECTING SURFACE WATERS IN UZBEK

SSR, (IN RUSSIAN), Uzbekskii Nauchno-Issledovatelskii Institut Sanitarii, Gigieny i Profzabolevanii, Tashkent (USSR). I. I. II'inskii.

Gig Sanit. 37(11): p 21-24. 1972. (English summary)

Identifiers: *Hygienic measures, *USSR(Uzbek-SSR), *Water quality, Water supply, Water treatment.

Studies were done over several years on the quality of surface waters in the vicinity of large industrial enterprises and towns of Uzbek SSR (USSR). In the majority of investigated neighboring sites of water intake, the existing protection measures were hygienically sufficient.—Copyright 1973, Biological Abstracts, Inc. W74-04838

AN EXPERIMENT IN SANITARY-VIROLOGI-CAL RESEARCH ON SEWAGE, (IN RUSSIAN), For primary bibliographic entry see Field 5B. W74-04849

SALMONELLA SEROTYPES IN SEWAGE OF VARIOUS ORIGINS, Nauchno-Issledovatelskii Institut Gigieny, Moscow (USSR). For primary bibliographic entry see Field 5B.

5G. Water Quality Control

APPROACHES TO STORMWATER MANAGE-MENT,

Hittman Associates, Inc., Columbia, Md. For primary bibliographic entry see Field 5A. W74-04458

STATE-OF-ART REVIEW: WATER POLLU-TION CONTROL BENEFITS AND COSTS, VOL

Development Planning and Research Associates, Inc., Manhattan, Kans. S. G. Unger, M. J. Emerson, and D. L. Jordening.

S. G. Unger, M. J. Emerson, and D. L. Jordening. Copy Available from GPO Sup Doc as EP1.23:600/5-73-0082, \$1.45; microfiche from NTIS as PB-228 603 \$1.45. Environmental Protection Agency, Socioeconomic Studies Series Report EPA-600/5-73-008a, October 1973. 121 p, 31 exhibits. EPA Project 21-AQJ-05, 68-01-0744.

Descriptors: *Cost-benefit analysis, *Water pollution control, Water quality control, Benefits, Costs, Economics, *Reviews, *Pollution abatement, *Cost comparison.

A survey and assessment are presented of the state-of-art of economic analyses dealing with water pollution control benefits and costs. The investigation includes the extension of traditional benefit cost analysis into the area of pollution control. Implications for planning and research plus some directions of needed study are also

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Water Quality Control—Group 5G

developed. A conceptual basis for benefit cost analysis involving water quality management is suggested. An economic concept of a social welfare function is presented as the most widely ac-cepted public criterion which embodies environmental quality concerns. Problems of efficiency, equity, externalities and social discount rates are outlines. Also, the adequacy of such information is outlines. Also, the adequacy of such information is assessed. Benefit measurements of water quality factors are meager and underdeveloped. A variety of parial-equilibrium approaches to benefit measurement are outlined and some problems, including the planning horizon (time profile), are described. To assess benefit cost impacts of water pollution control, location-preserved analyses are pollution control, location-preserved analyses are necessary. An aggregation framework is needed. General systems analysis approaches are im-plicitly required to measure benefits and costs of pollution control. Recent developments in the literature have begun to directly assess impacts of environmental quality management. In this setting, benefit cost analysis effectively becomes a supplementary analysis of alternative sets of simulated general equilibrium types of economic solutions. (Freeman-EPA) W74-04464

RESEARCH NEEDS AND PRIORITIES: WATER POLLUTION CONTROL BENEFITS AND COSTS, VOL. II,
Development Planning and Research Associates, Inc., Manhattan, Kan.
D. L. Jordening, and J. K. Allwood.
Copy available from GPO Sup Doc as EP1.23:600/5-73-008b, \$2.10; microfiche from NTIS as PB-228 602 \$1.45. Environmental Protection Agency Socioeconomic Study Series Report tion Agency, Socioeconomic Study Series Report, EPA-600/5-73-008b, October 1973. 198 p, 29 ex-hibits. EPA Project 21-AQJ-05, 68-01-0744.

Descriptors: *Cost-benefit analysis, *Water pollu-Descriptors: "Cost-ceneral analysis," water pollu-tion control, Water quality control, Benefits, Costs, Economics, "Research priorities, "Pollution abatement," Cost comparisons. Identifiers: "Research needs.

A specification is presented of research needs and priorities involving water pollution control costs and benefits. A series of theoretcal and methodological research needs are presented. Water quality management is required in a dynamic setting and over a broad range of hydrologic and control condition. economic conditions. The common property resource aspects of the problem with the prevalence of externalities complicates the issues involved. These and other factors embedded in the research needs are discussed. A major development of a cost-minimization methodological approach for water quality management is also presented. Within this framework the indicated research needs are more readily identified and ex-plained. An important distinction is made between the economic costs of pollution and the costs of pollution abatement. The economic costs of pollution such as damages, efficiency reductions, increased production expenses, process changes and opportunity costs are a function of water quality, whereas pollution abatement costs are typically a function of the degree of pollution control. For comparable cost comparisons, a transformation of pollution abatement costs in terms of water quality is desired. This transformation need and problem is discussed in detail. Finally, in a series of technian uncussed in detail. Finally, in a series of techni-cal appendicies, the following subjects are discussed: (1) water pollution control cost and benefit estimates, (2) water quality associated health impacts. (Freeman-EPA) W74-04465

STATE ENVIRONMENTAL MANAGEMENT, CASE STUDIES OF NINE STATES, E. H. Haskell, and V. S. Price. Praeger, New York, N.Y. 1973. 283 p. Price: \$5.95.

Descriptors: *State jurisdiction, *Planning, *Regulation, *Pollution, *State governments, Ad-

ministrative agencies, Water pollution, Waste disposal, Land use, Natural resources, Illinois, Washington, Wisconsin, Minnesota, New York, Maine, Vermont, Maryland, Michigan. Identifiers: *Environmental management, Judicial

Ways are examined in which 9 state governments have restructured organizationally in order to imnave restrictured organizationally in order to im-prove environmental protection through new regu-latory powers over pollution and land use problems. Two types of reforms are covered. The first are new environmental departments created by the reorganization of existing state agencies to by the reorganization of existing state agencies to give pollution and resource programs an 'ecological' perspective and higher priority in state government. Programs adopted by Illinois, Washington, Wisconsin, Minnesota, and New York are analyzed. The second set of changes evaluated involve new organizations to implement state strategies for land use control, waste management and citizen action. Vermont and Maine have created agencies to regulate land development, statewide. In Maryland, the state Environmental Service has the authority to draft environmental service has the authority to drain regional plans, finance, build, operate, and own solid and liquid waste treatment and disposal facilities, wholesaling services to local govern-ments and industry. Michigan has given state courts a new role through the inception of publicinterest lawsuits by private citizens. Criteria for evaluating public environmental institutions are developed. In accordance with these criteria, recommendations are made for a model state en-vironmental structure. (Hoffman-North Carolina)

ENVIRONMENTAL QUALITY, THE FOURTH ANNUAL REPORT OF THE COUNCIL ON EN-VIRONMENTAL QUALITY.

Council on Environmental Quality, Washington,

U.S. Government Printing Office, Washington, D.C., September 1973. 499 p, \$4.30.

Descriptors: *Water pollution, *Pollution abatement, *Regulation, Institutional constraints, Governments, Federal Water Pollution Control Act, Water quality, International waters, International commissions, Earth-water interface, Public access, Great Lakes, Costs. Identifiers: *Willamette River(Oregon), Greenway

Identifiers: *Willamette River(Oregon), Greenway Concept, Water quality index, EPA eutrophication study, Federal Water Pollution Amendment of

Seven categories of environmental concern are covered: the urban environment; water quality im-provement; economics and environmental management; law and land use regulations; federal environmental programs; international environ-mental programs; environmental status and trends; and the citizen's role in environmental improvement. The topic of water resources is treated oth individually and in relation to economics, land use, law, and international and federal programs. The cleanup of the Willamette River in Oregon is examined as a model of the process of reversing water pollution. The effect of the clean river on land use along the river, including public access and associated recreational facilities, is also studied. The chapter on the relationship between economics and environmental policy describes four types of environmental costs of pol-lution and pollution control: abatement costs, avoidance costs, transaction costs, and damage costs. Judicial response to restrictions on the filling or developing of low-lying marsh and coastal lands is discussed in the context of the limitations imposed by the 'taking' clause on state and local governmental efforts to protect environmentally critical areas. The Federal Water Pollu-tion Control Act Amendments of 1972 are summarized and analyzed. Efforts to monitor water pollution are surveyed. The pollution status of the Great Lakes and the oceans is examined. International environmental protection concerns, including protection of the oceans and control of trans-boundary pollution, are discussed. (Hoffman-North Carolina) W74-04504

MANAGING GROWTH IN A FRAGILE EN-VIRONMENT: PROBLEMS OF THE ROCKY MOUNTAIN STATES, Colorado State Univ., Fort Collins. For primary bibliographic entry see Field 6D.

W74-04505

1972 REVIEW OF THE LITERATURE ON PULP AND PAPER EFFLUENT MANAGEMENT, National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5D.
W74-04540

PHYSICOCHEMICAL PROCESSES FOR WATER QUALITY CONTROL,
Michigan Univ., Ann Arbor. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.

W74-04546

WASTE AUTOMOTIVE LUBRICATING OIL AS A MUNICIPAL INCINERATOR FUEL, GCA Corp., Bedford, Mass. GCA Technology Div. For primary bibliographic entry see Field 5D. W74-04549

BENEFIT OF WATER POLLUTION CONTROL

ON PROPERTY VALUES, Dornbusch (David M.) and Co., Inc., San Fran-

CISCO, CAIR.

D. M. Dornbusch, and S. M. Barrager.

Copy available from GPO Sup Doc as
EP1.23:600/5-73-005, \$1.60; microfiche from NTIS
as PB-228 590, \$1.45. Environmental Protection Agency, Socioeconomic Studies Series Report, EPA-600/5-73-005, October 1973. 148 p, 14 fig, 15 tab, 15 ref. EPA Project 01AAB-07, Contract 68-01-0753

Descriptors: Water quality, *Water quality control, *Economics, *Benefits, *Property values, *Regression analysis, *Pollution abatement. Identifiers: San Diego Bay, Kanawha River(Ohio), Willamette River.

This study was undertaken to determine the current state-of-knowledge concerning the measure-ment of the potential benefit of water pollution control on property values, and to analyze the relationship between water quality parameters and property values at several sites where water pollu-tion has been substantially reduced in recent years. Multiple-regression analysis and an inter-view technique were employed to study the rela-tionship between residential and recreational property values and water quality components. Study sites were located on San Diego Bay and the Kanawha, Ohio, and Willamette Rivers. It was found that effective pollution abatement on badly polluted water bodies can increase the value of single-family homes situated on waterfront lots by 8 to 25 percent, and that these water quality imrovements can affect property values up to 4000 feet away from the water's edge. The measurable water quality parameters which have the greatest influence on property values are dissolved oxygen concentration, fecal coliform concentrations, clarity, visual pollutants (trash and debris), toxic chemicals, and pH. Case study results were com-bined with a 1971 EPA water pollution survey to estimate the national benefit expressed in increased residential, recreational and rural water-front property values, to be gained from water polhatton abatement. The oe gamed from water pol-lution abatement. The estimated capital value of the benefit ranges from .6 to 3.1 billion dollars, with a most likely benefit of 1.3 billion dollars. (EPA)

Group 5G-Water Quality Control

W74-04550

ENVIRONMENTAL IMPACT REVIEWING STATEMENTS-POWER PLANT OF SYSTEMS, ENGINEERING ASPECTS. COOLING

Pacific Northwest Environmental Research Lab., Corvallis, Oreg. Copy Available from GPO Sup Doc

Copy Avaniable from GPO Sup Doc as EP1.23:660/2-73-016, \$1.35; microfiche from NTIS as PB-228 604 \$1.45. Environmental Protection Agency, Technology Series Report EPA-660/2-73-016, October 1973. 95 p, 12 fig, 9 tab, 60 ref. EPA Program Elements 1BA032 and 1BB392.

Descriptors: *Thermal powerplants, *Nuclear powerplants, *Environmental effects, Electric power, cost-benefit analysis, Cooling towers, *Thermal pollution, *Reviews.

Identifiers: *Environmental impact statements, Cooling water systems.

This report describes the approach and technical base that have been used by EPA's National Ther-mal Pollution Research Program for reviewing those portions of Environmental Impact Statements (EIS's) relative to the engineering aspects (including economics) of cooling water systems for thermal power plants. Techniques and data are provided to enable the EIS reviewer to make sound judgements concerning the adequacy of both the cooling water system selected for the power plant and the EIS comments on that system. Literature citations are provided to direct the reviewer to additional and more detailed information. Information and discussions are provided on cooling system configuration, operation, environ-mental effects, and costs. Consideration is given to the intake as well as the discharge. Various closed-cycle cooling systems employing cooling towers, cooling ponds, spray systems, and other devices are covered. Methods of assessing alterna-tive slections and benefit-cost analyses are presented. Non-thermal aspects of cooling water systems are discussed. The report lays the ground-work for a technically sound EIS review; however, the reviewer must supplement the material presented with references and perhaps technical consultation to prepare comprehensive and detailed review comments. (EPA) W74-04555

LABORATORY STUDY OF SELF-SEALING LIMESTONE PLUGS FOR MINE OPENINGS, NUS Corp., Pittsburgh, Pa. Cyrus Wm. Rice Div.

R. G. Penrose, Jr., and I. Holubec. Copy Available from GPO Sup Doc as EP1.23:670/2-73-081, \$2.25 microfiche from NTIS as PB-228-586. Environmental Protection Agency, Technology Series Report EPA-670/2-73-081, September 1973. 217 p, 63 fig, 114 tab, 2 ref. EPA Project 14016 JBU, Contract 68-01-0135.

Descriptors: *Limestones, *Acid mine water, *Laboratory tests, *Pilot plants, Neutralization, *Sealants, *Aggregates, Iron, Particle size, Cements, Permeability, Compressibility, Strength of

Identifiers: *Mine seals, Ferrous waters, Ferric water.

Laboratory studies of self-sealing limestone plugs for mine openings were conducted to determine the optimum limestone material for such a treat-ment and sealant technique. Conducting a thorough study of the performance of such plugs required pilot plant operations utilizing synthetic solutions representative of anticipated acid mine waters, aggregate additives to improve plug performance, and several basic types of limestone which were varied interms of size gradation and placement density. The types of limestone used were selected from results of a previous neutralization study; synthetic mine waters were prepared to EPA formulations for ferric, ferrous, and ferrous/ferric solutions; and percentage ad-mixture of bentonite, flyash and air-cooled blast furnace slag additives were used with the aggregate. Experimental results indicated that permeability, compressibility and strength of a limestone plug are primarily a function of the par-ticle size distribution and density. Plug per-formance was most effective with high limestone placement density and smaller gradation of stone. Ferric waters were controlled most effectively. Additive effects were less significant throughout the tests. Further tests were conducted on the effects of particle size distribution variations and placement density and other additives to cement particles into an effective plug. (EPA) W74-04559

APPLICATION OF DYNAMIC PROGRAMMING IN MARKOV CHAINS TO THE EVALUATION OF WATER QUALITY IN IRRIGATION,

Hebrew Univ., Jerusalem (Israel). For primary bibliographic entry see Field 3C. W74-04561

WATER QUALITY IMPROVEMENT IN RIVER BASINS (EXPERIENCE OF INDUSTRIALIZED BASINS (EXPERIENCE OF INDUSTRIALIZED COUNTIRES) (O POVYSHENII KACHESTVA VODY V RECHNYKH BASSEYNAKH (OPYT INDUSTRIAL'NYKH STRAN)),

A. D. Pobedimskiy. Vodnyye Resursy, No 3, p 187-200, 1973. 5 fig, 4

Descriptors: *River basins, Water quality, *Water quality control, *Water pollution control, Waste treatment, *Waste water treatment, *Water treatment, ment, Water purification, Economics, Costs. Identifiers: *USSR. Model studies,

The magnitude of water pollution in industrialized countries and measures being undertaken to improve water quality in their river basins are described. These measures include research on an economically optimal water quality improvement system; development of an optimal system of waste dilution; artificial reaeration of water flows; construction of large treatment facilities; and use of sensors for automated water quality monitoring.
All methods are illustrated by specific examples. (Josefson-USGS) W74-04583

HYDROLOGIC INVESTIGATION AND DESIGN IN URBAN AREAS--A REVIEW, Snowy Mountains Engineering Corp., Cooma

(Australia). For primary bibliographic entry see Field 2A. W74-04597

EFFECTS OF BACKPUMPING FROM SOUTH NEW RIVER CANAL AT PUMP STATION S-9 ON QUALITY OF WATER IN WATER-CON-SERVATION AREA 3, BROWARD COUNTY, FLORIDA, Geological Survey, Tallahassee, Fla

For primary bibliographic entry see Field 5B. W74-04600

WRONG WITH GOVERNMENT WATER CONTROL PROGRAMS AND HOW

THEY CAN BE IMPROVED,
Georgia Coll., Milledgeville. Dept. of Business Administration and Economics. For primary bibliographic entry see Field 5D. W74-04632

STATE STANDARDS FOR TEMPERATURE, (ISSUED BY THE ENVIRONMENTAL PROTEC-TION AGENCY IN AUGUST 1972). Environmental Reporter, p 33-54, 1973, 2 tab.

Descriptors: *Regulation, Governments, *Water policy, *Water temperature, Water quality control. Management. Federal government. *State governments, Interstate rivers, Thermal properties, Cooling, Thermal pollution, Legislation, Seasonal, Aquatic environment, Fish, *Water

Excerpts from individual Federal-State water quality standards establishing temperature criteria for interstate waters have been compiled in order to provide general information to the public as well as Federal, State, and local officials. This report represents the first nationwide strategy for water quality management and reflects the major uses to be made of the water (recreation, drinking water, be made of the water (recreation, drinking water, fish and wildlife propagation, industrial, or agricultural uses). Temperature standards are set to control thermal pollution, which may create adverse conditions for aquatic life, accelerate biological processes in the streams, reduce the dissolved oxygen content of the water or increase the growth of aquatic plants. Individual state-adopted criteria are listed with the latest revisions of standards as of the date of printing. (Jerome-Vanderbilt) W74-04669

ROLE OF PHYTO- AND ZOOPLANKTON IN SELF-PURIFICATION PROCESSES (EXEMPLIFIED BY OXIDATION PONDS), (IN

Belorussian State Univ., Minsk (USSR).

Beiorussian state Univ., Minsk (USSA).

N. M. Kryuchkova.

Gidrobiol Zh. Vol 8, No 5, p 106-111. 1972.

Identifiers: Metabolism, Microbial processes,

*Oxidation ponds, *Phytoplankton,

*Zooplankton, *Self purification.

In addition to the known value of microbiological processes, the activity of phyto- and zooplankton plays a major role in the self-purification of water plays a major role in the set-purification of water bodies. The examples given show that under cer-tain conditions phyto- and zooplankton acquire decisive significance for self-purification processes. However, in all cases this process is the general result of the activity of the entire microbial, plant, and animal population of the water body or stream.--Copyright 1973, Biological Abstracts, Inc. W74-04692

EFFECT OF LONG-TERM APPLICATION OF VARIOUSLY HIGH RATES OF NUTRIENTS ON NATURAL GRASSLAND SWARDS.

For primary bibliographic entry see Field 4A. W74-04693

ANTI-POLLUTION BARRIER.

Etablissements Hutchinson Compagnie Nationale du Caoutchouc, Paris (France)(Assignee).

G. A. Lamboley.
U.S. Patent No 3,775,982, 4 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 917, No 1, p 68, December 4, 1973.

Descriptors: *Patents, *Barriers, *Oil spills, *Oil pollution, Coasts, Tides, Waves(Water), (*Shore protection, *Pollution abatement, Water quality control, Water pollution control.

An anti-pollution barrier consists of a watertight skirt, which has floats and ballast and is connected to a tension element having tensile strength at spaced apart points defining longitudinal segments on the skirt and on the tension element. The tension element is a semi-rigid flat strip which is located roughly midway up the height of the skirt and rigidly fastened to the skirt by transverse stiffening provided at the respective fastening points. To preclude a tilting of the barrier of more than 90 deg, it is desirable that a reinforcing strip constitute an auxiliary ballast opposing the raising torque. The skirt thus maintains under all circumstances a definite orientation which enables it to be used as a coastal barrier in a tidal region.
(Sinha-OEIS) W74-04705

WATER RESOURCES PLANNING—Field 6

Evaluation Process—Group 6B

SKIMMER TRAP,

R H Field

U.S. Patent No. 3,774,767, 3 p, 4 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 916, No 4, p 1360, November 27, 1973.

Descriptors: *Patents, *Skimming, Separation techniques, *Flotsam, *Pollution abatement, *Water treatment, *Water quality control.

The trap consists of an elongated buoyant tubular The trap consists of an elongated budyant thousan member having angled inner and outer ends. A water flow intercepting flat strip is affixed to the upstream side of the tubular member with the strip including a skimmer-engaging angled inner end. The corresponding inner end of the buoyant member engages the side of the pool and properly orientates the trap at a projecting 45 deg angle for an interception of the flow-impelled debris and the directing of it into the skimmer. The outer end of the buoyant member is directed upstream for a confining of the floating debris. The entire trap is stabilized and retained in position by an elongated cord-like member extending from a midpoint along the trap to a simple decorative weight positioned as desired along the pool edge. As an auxiliary aid in the gathering of the debris, an arcuate shield can be removably clipped on the tubular member. (Sinha-OEIS)

ANTI-POLLUTION BARGE AND CONVEYER ASSEMBLY.

J. A. Anderson. U.S. Patent No. 3,762,558, 3 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 915, No 1, p 161, October 2, 1973.

Descriptors: *Patents, *Oil pollution, Separation techniques, Equipment, Barges, *Oil spills, *Pollution abatement, Water quality control, *Water pollution control, *Conveyance structures.

A bottom conveyer is constructed and arranged so A bottom conveyer is constructed and arranged so as to be supported by the bow of a barge. It protrudes downward and forward. A top conveyer is mounted superjacent to the bottom conveyer and works with it. Each of the conveyers has an imperforate flexible endless belt. The adjacent runs of the belts are flat surfaces longitudinally and transversely of the belts. The superjacent conweyers are arranged to pick up a floating pollutant and convey it upward between adjacent runs of the respective conveyers. Transverse ribs are secured to the top conveyer and extend therefrom into liquid-tight edgewise engagement with the top rum of the bottom conveyer. Longitudinal flexible wings are arranged to laterally confine the picked up pollutants and water during upward displace-ment thereof. The conveyers are pivoted onto the barge. The barge is provided with water ballast tanks to adjust the dipping depth of the outer end of the conveyers. (Sinha-OEIS)
W74-04718

A REPORT ON THE LIMNOLOGY OF MON-

A REPORT ON THE LIMINOLOGY OF MON-ROE RESERVOIR, INDIANA, Indiana Univ., Bloomington. School of Public and Environmental Affairs. For primary bibliographic entry see Field 2H. W74-04792

PROBLEM OF PURE WATER IN THE USA, (IN RUSSIAN).

Vsesoyuznyi Institut Nauchno-Tekhnicheskoi Iaformatsii po Selskomu Khozyaistvu, Moscow (USSR). V. D. Fokina

v. D. Fokina. Gig Sanit. 37(10): p 71-73. 1972. Identifiers: *Oil pollution, *Thermal pollution, *Water pollution sources, Oil spills, *Water pollu-tion control, *Legislation.

Information is given on the main sources of water pollution in the USA, losses due to oil spills, ther-

mal pollution, federal laws passed concerning pollution and measures taken by various industries to control pollution.--Copyright 1973, Biological Ab-

SOME PROBLEMS INVOLVED IN OPTIMAL PROTECTION OF THE ENVIRONMENT IN

Instytut Balneoklimatyczny, Poznan (Poland). A. Madevski.

Balneol Pol. Vol 16, No 3/4, p 241-246, 1971. Identifiers: Air pollution, *Environmental protection, Noise pollution, *Spas, Water pollution

Health resorts should be away from urban agglomerations. The natural capacity of the environment should not be overreached. Industrial plants should be erected far away from these places. Noise, water and air pollution should be avoided.--Copyright 1973, Biological Abstracts, Inc. W74-04847

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

OPTIMAL OPERATION OF MULTI-RESER-VOIR WATER RESOURCES SYSTEMS,
Texas Univ., Austin. Center for Research in

Water. For primary bibliographic entry see Field 4A. W74-04314

MATHEMATICAL MODELING FOR STATUS PREDICTION AND CONTROL OF WATER DIS-

TRIBUTION SYSTEMS, General Electric Co., Philadelphia, Pa. For primary bibliographic entry see Field 4A. W74-04320

FLOOD PROOFING DECISIONS UNDER UN-CERTAINTY: AN APPLICATION TO THE CON-NECTICUT RIVER BASIN, Massachusetts Univ., Amherst. Dept. of Agricul-

tural and Food Economics.

P. Aklilu, and C. E. Willis.

Available from the National Technical Informa-tion Service as PB-228 133 \$8.50 in paper copy, \$1.45 in microfiche. Water Resources Research Center, University of Massachusetts, Amherst, Publication No 33, August 1973. 99 p, 4 fig, 19 tab, 64 ref, 2 append. OWRR B-028-MASS(1), 14-31-

Descriptors: *Flood damage, *Non-structural alternatives, *Computer programs, Optimization, Economic efficiency, *Flood control, Maximum probable flood, *Connecticut River, *Risks, *Decision making, Benefits, Costs, Model studies,

Identifiers: Flood proofing, Expected values.

Results are presented of the economic potential of flood proofing measures for reducing flood damages. The empirical application focuses on several communities in the Connecticut River Basin. A literature review of flood proofing measures and a treatment of decision-making under uncertainty are included. A partial equilibrium framework (model) for making flood proofing choices for various types of structures is also provided. The output of this model takes the form of expected values and standard deviations of net benefits from flood proofing. These computer results are tabulated, and some remarks are made concerning the incidence of benefits and costs of such flood damage reduction measures.

APPLICATION OF DYNAMIC PROGRAMMING IN MARKOV CHAINS TO THE EVALUATION WATER QUALITY IN IRRIGATION, Hebrew Univ., Jerusalem (Israel). For primary bibliographic entry see Field 3C. W74-04561

ALLOCATION OF FUNDING FOR WASTE-WATER TREATMENT FACILITIES, Colorado State Univ., Fort Collins. Dept. of Civil Engineering.

For primary bibliographic entry see Field 5D. W74-04562

ECONOMIC ASPECTS OF GROUND WATER RESOURCES AND REPLACEMENT FLOWS IN SEMIARID AGRICULTURAL AREAS. New Mexico Univ., Albuquerque. For primary bibliographic entry see Field 4B.

A SIMULATION MODEL FOR EVALUATING IRRIGATION MANAGEMENT PRACTICES, Minnesota Univ., St. Paul. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 3F.

W74-04564

COST-BENEFIT ANALYSIS OF IRRIGATION PROJECTS IN NORTHEASTERN BRAZIL. Brookings Institution, Washington, D.C. For primary bibliographic entry see Field 3F. W74-04565

ALLOCATION OF SCARCE RESOURCES TO AGRICULTURAL RESEARCH: REVIEW OF METHODOLOGY,

North Crolina State Univ., Raleigh. Dept. of **Economics** For primary bibliographic entry see Field 3F.

6B. Evaluation Process

A DETAILED INVESTIGATION OF THE SOCIOLOGICAL, ECONOMIC, AND ECOLOGICAL ASPECTS OF PROPOSED RESERVOIR SITES IN THE SALT RIVER BASIN OF KENTIGERY

Kentucky Water Resources Inst., Lexington. For primary bibliographic entry see Field 2A. W74-04310

SOCIOCULTURAL IMPACT OF RESERVOIRS ON LOCAL GOVERNMENT INSTITUTIONS. ANTHROPOLOGICAL ANALYSIS OF SOCIAL AND CULTURAL BENEFITS AND COSTS FROM STREAM CONTROL MEASURES-

Kentucky Water Resources Research Inst., Lexington.

P. Drucker, J. E. Clark, and L. D. Smith Available from National Technical Information Service as PB-227 968 \$8.75 in paper copy, \$1.45 in microfiche. Research Report No 65, 1973. 108 p, 9 tab, 33 ref, append. OWRR B-027-KY(2). 14-31-0001-3595.

*Kentucky, *Social Descriptors: *Institutions, Planning, Assessments, Highway relocation, Law enforcement, *Local governments, Roads, Zoning, *Social change, Social values, *Taxes, Tourism, Water supply, *Land use, Land development, *Pre-impoundment, Post-impoundment, Reservoir sites, Community development.

This study of the probable sociocultural impact of a proposed reservoir in central Kentucky on the institutions of local governments of a community

Field 6-WATER RESOURCES PLANNING

Group 6B—Evaluation Process

adjacent to the reservoir utilizes anthropological concepts of social values and cultural and social change as well as anthropological research techniques. Data on observed impact on the same institutions in communities adjacent to two recently completed Kentucky reservoirs permit inferences as to probable directions and extent of reservoir-related change. Specific aspects of im-pact considered include: effects of reduction of the county tax base due to Federal acquisition of lands, including necessity for increased severity of taxes and changes in assessments, problems re-lated to effective planning and zoning, potential benefits from development or expansion of city and county potable water supply, effects of reservoir-caused highway relocation on county roads and county road maintenance, and effects of reservoir-created tourism patterns on local law enforcement. The overall purpose is to recommend to the agency (Corps of Engineers) that is causing massive environmental change through creation of a manmade lake, improvements in policies and procedures that will increase sociocultural benefits and decrease sociocultural costs. (See also W74-00558) (Grieves-Kentucky) W74-04311

SOCIAL, ECONOMIC, ENVIRONMENTAL, AND TECHNICAL FACTORS INFLUENCING WATER REUSE,

Utah Center for Water Resources Research, Logan. For primary bibliographic entry see Field 5D.

W74-04317

MULTIPURPOSE RESERVOIRS AND URBAN

DEVELOPMENT, North Carolina Univ., Chapel Hill. Center for Urban and Regional Studies.

R. J. Burby, III, T. G. Donnelly, and S. F. Weiss. Available from National Technical Information Service as PB-228 009 \$3.75 in paper copy, \$1.45 in microfiche. Workshop on 'Planning the Development and Use of Reservoir Shorelines in North Carolina' at Chapel Hill, North Carolina, Sep-tember 21, 1972. 44 p, 8 tab, 3 fig, append. OWRR B-012-NC(12)

Descriptors: *Recreation demand, Recreation facilities, Reservoirs, *Computer models, *Land development, *Impoundments, Recreation, Model studies, Land use, Land tenure, Water resources. Rural areas, Community development, Boating, Southeast U.S., *Georgia, *North Carolina, *Urbanization, *Multiple-purpose reservoirs. Identifiers: Second home communities, Vacation home developments, Development process, Lake Sidney Lanier(Ga.), Lake Norman(N.C.), Land development firms, Reservoir development agen-

The development of recreational communities in rural hinterlands of metropolitan areas can cause environment and service problems for affected governmental units. This development process, initiated by a reservoir owner wishing to create a water impoundment, proceeds through a series of stages beginning with rural use and ending with seasonal or permanent residence. About 75% of lots are developed by land development firms, as seen in recreational subdivisions adjacent to Lake Norman, North Carolina, and Lake Sidney Lanier, Georgia. Various attractiveness factors motivate consumer purchases of lots, including character of the property and proximity to reser voir, friends, cities, and work. A computer model simulates these location patterns through a randomized procedure assigning households to sites according to the supply of land and its attractiveness for residential use. The model 'forecasted' 1969 patterns to compare results obtained from the simulation with actual development. Results showed more scatterization than actually occurred in these communities; more precise land use constraints could eliminate this problem. Since factors determining residential patterns in each community are unique, no general set of inputs can exist. Refinements in the model are needed, but it can still aid in anticipating problems with development recreational communities. (Gorden-North W74-04319

INSTITUTIONAL FRAMEWORK AFFECTING THE USE OF INLAND WETLANDS IN MAS-SACHUSETTS.

Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics. For primary bibliographic entry see Field 4A. W74-04462

STATE-OF-ART REVIEW: WATER POLLU-TION CONTROL BENEFITS AND COSTS, VOL

Development Planning and Research Associates. Inc., Manhattan, Kans For primary bibliographic entry see Field 5G. W74-04464

RESEARCH NEEDS AND PRIORITIES: WATER POLLUTION CONTROL BENEFITS AND COSTS, VOL. II,
Development Planning and Research Associates,

Inc., Manhattan, Kan. For primary bibliographic entry see Field 5G. W74-04465

ESTIMATING THE BENEFITS OF STREAM VALLEY AND OPEN SPACE PRESERVATION PROJECTS, Regional Science Research Inst., Philadelphia, Pa.

R. E. Coughlin, and T. R. Hammer. In: Government Spending and Land Values: Public Money and Private Gain, ed. by C. L. Harriss. University of Wisconsin Press, Madison, p 155-170, 1973. 5 fig, 2 tab.

Descriptors: *Project benefits, *Estimated benefits, Streams, *Water pollution effects, Evaluation, Analysis, Pricing, Value, *Water quality, *Pennsylvania, *Parks.

Identifiers: *Environmental quality, *Location rent gradient, Land values, Pennypack Park, *Philadelphia(Penn), Ecological benefit, Open

Benefits are estimated for environmental projects that involve maintaining the water quality of streams and keeping extensive areas of land undeveloped. Environmental values are translated into land values. Given that persons considering a residential site near some amenity are able to imagine the use and enjoyment to be derived, and that people are willing to attach some monetary value to this use and enjoyment, environmental benefit differences create a location rent gradient. A number of studies of people's response to environmental quality are summarized. Relative to the hypothesized preconditions for location rent, the studies suggest that: (1) people do not do a good job of imagining how they would make use of an amenity if they lived nearby and; (2) even those who are currently enjoying benefits of some environmental amenity may not attribute a very high monetary value to it. Implied is that environs benefits may be undervalued and that this is reflected in location rents. Property values around Pennypack Park in Philadelphia, Penn. were used to estimate the value of location rent generated by a stream-valley park. Location rent ranged from about \$1,171 per property at 40 feet from the park to \$104 per property at 2,500 feet from the park. Considering that the opportunity cost of retaining the park would be \$13 million, location rent is heavily underestimated. (Hoffman - North W74-04500

CAPITALIZATION OF THE BENEFITS OF WATER RESOURCE DEVELOPMENT. Kansas Univ., Lawrence.

D. W. Daicoff.

In: Government Spending and Land Values: Public Money and Private Gain, ed. by C. L. Har-riss. University of Wisconsin Press, Madison, p

Descriptors: *Project benefits, *Water resources development, Recreation, Navigation, Flood con-trol, *Property values, Capital. Identifiers: *Capitalization of benefits, Property value increases.

The consequences of governmental expenditures on water resource development projects for the on water resource development projects for me value of real property in terms of capitalization of benefits is considered. The present value of the ex-penditure-benefit augmented value stream can be found by discounting a stream of government ex-penditure benefits and adding them the discounted stream of private benefits. By subtraction the capitalized value of the expenditure benefit may be estimated. Several conditions, relating to the type of object or activity benefited by the public expenditure and to the specific nature of the expenditure benefits, are necessary for capitalization of water resource development projects. They are:
(1) the object or activity must be salable; (2) some of the benefits must be in the future; (3) there must be some differential to be capitalized; and(4) benefits must not be shifted to another object or activity. The influence of fload control. activity. The influence of flood control, navigation, and recreation project expenditure on the value of property is discussed. Empirical studies cited show that a portion of the benefits of water resource development projects is observable in property value. Some questions remain, though, as to the degree of capitalizalization and the extent to which it can be measured. (Hoffman-North Carolina)

LAND VALUE INCREMENTS AS A MEASURE OF THE NET BENEFITS OF URBAN WATER SUPPLY PROJECTS IN DEVELOPING COUN-

SUPPLY PROJECTS IN DEVELOPING COUNTRIES: THEORY AND MEASUREMENT,
Maxwell Graduate School of Citizenship and
Public Affairs, Syracuse, N.Y. Metropolitan and
Regional Research Center.
R. W. Bahl, S. P. Coelen, and J. J. Warford.
In: Government Spending and Land Values:
Public Money and Private Gain, ed. by C. L. Harries University of Wiscopsin Press Medicary

riss. University of Wisconsin Press, Madison, p 171-188, 1973.

Descriptors: *Water supply development, *Project benefits, *Estimated benefits, Evaluation, Regression analysis, Pricing, Value, Land development, *Water supply. Identifiers: Water supply benefit measurement, *Land values, Control area analysis, *Developing

The market for water services does not permit benefit estimation of the willingness of individuals to pay for public improvements in water. Land values can be used as an additional measure: the increased consumers' surplus area under the demand curve in the water market is transferred into an equivalent shift in area under the property market demand curve. All benefits of a water supply project not measured in renevues derived directly through sales in the water market can be measured from the consumer surplus transferred from water to property markets. Two supply and demand con-ditions are necessary for the land value increment to totally exhaust the benefit increment: the slope of the demand curve for housing in the project area cannot change; and the supply curve must be perfectly inelastic. Given these conditions any periccuy inetastic. Given these conditions and error in true benefits of a water supply will be on the conservative side. Three possible approaches to empirical measurement of water supply benefits are suggested: a regression model using dummy variables to indicate exogeneous factors affecting

Water Law and Institutions—Group 6E

land values; a control area analysis where the control area is expected to be similar in all respects to trol area is expected to be similar in an respects whe project area except for the water project; and a modified, combined regression-control area model. A brief discussion of other land-value studies, as well as behavioral and institutional relationships that affect the investment-land value nexus is included. (Hoffman-North Carolina) W74-04502

BENEFIT OF WATER POLLUTION CONTROL ON PROPERTY VALUES, Dornbusch (David M.) and Co., Inc., San Fran-

cisco. Calif. For primary bibliographic entry see Field 5G. W74-04550

ALLOCATION OF FUNDING FOR WASTE-WATER TREATMENT FACILITIES,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5D.
W74-04562

COST-BENEFIT ANALYSIS OF IRRIGATION PROJECTS IN NORTHEASTERN BRAZIL, Brookings Institution, Washington, D.C. For primary bibliographic entry see Field 3F.

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

STUDY OF PULP AND PAPER INDUSTRY'S EF-FLUENT TREATMENT. EKONO, Helsinki (Finland). For primary bibliographic entry see Field 5D. W74-04538

EVALUATION OF THE USE OF PRICING AS A E-VALUATION OF THE USE OF PRICING AS A TOOL FOR CONSERVING WATER, George Washington Univ., Washington, D.C. Dept. of Management Sciences. For primary bibliographic entry see Field 3D. W74-04810

6D. Water Demand

MANAGEMENT OF STORMWATER RUNOFF IN SUBURBAN ENVIRONMENTS, Engineering-Science, Inc., Cincinnati, Ohio. For primary bibliographic entry see Field 5D. W74-04302

THE RAJASTHAN CANAL AREA: A SETTLE-MENT STRUCTURE, Delhi Univ., New Delhi (India). School of Planning and Architecture. L. Vagale.

Urban and Rural Planning Thought, Vol 16, No 3, p 148-186, July, 1973. 15 fig, 17 tab, 18 ref.

Descriptors: Irrigation, *Irrigation programs, Irrigation systems, *Irrigation canals, *Irrigation districts, *Land use, *Canals, Land management, Water management, Land, Arable land, Distribu-

water management, Land, Arabie land, Distribu-tion systems, Cultivation, Crop production, Cul-tivated lands, Agriculture.
Identifiers: *India(Rajasthan Canal Project), Colonization, Settlement hierarchy, Multi-level planning system, Five Year Plan.

The Rajasthan Canal Project, an irrigation plan undertaken by the Indian government, hopes to irrigate 6.7 million acres of land by distributing water through a canal network 45,341 miles long. Started in 1958, it will be implemented in two stages, but work is behind schedule. Apart from the irrigation project, planned 'colonization' must

be implemented. This includes a functional hierarchy of villages linked by transportation modes, provided with the necessary infrastruc-ture, and familiarized with new techniques of irrigation and agriculture. Population distribution patters, optimum size of land holdings, desirable crop patterns, and other factors must be considered. Basic villages, with 1200-1500 people, form the first order settlement in the hierarchy, providing basic services for the community. Central villages, with 4,000-5,000 people form the second tier, serving 4-6 villages. Market towns, with 20,000-25,000 inhabitants, form the next level and are located along major canals. The sub-regional center, with 40,000-50,000 people, is the highest order of settlement. Located along main canals, they serve 6-8 market towns, 30-40 central villages, and 140-150 basic villages. A multidisciplinary approach, including land and water use planning, is essential for this area's develop-ment. (Grden - North Carolina)

MANAGING GROWTH IN A FRAGILE EN-VIRONMENT: PROBLEMS OF THE ROCKY MOUNTAIN STATES,

Colorado State Univ., Fort Collins.

E. Vlachos. Presented at Symposium on 'Property Rights and Institutions for Achieving Public Interests in Management of Land Resources,' Annual meeting

of American Association for Advancement of Science, Washington, D.C., December 26-31, 1972. 45 p, 4 fig, 1 tab. OWRR B-083-COLO(1).

Descriptors: *Planning, *Water supply, *Water demand, *Environmental effects, *Growth rates, *Rocky Mountain region, Water resources, Urban land use, Coordination, Water resources, Uroan land use, Coordination, Water quality, Montana, Idaho, Wyoming, Colorado, Nevada, Arizona, Utah, New Mexico, Management, Water shortage, Water rights, Political aspects, Water requirements, Water pollution, Urbanization, Regulation.

Identifiers: Growth management, *Regulatory

In the Rocky Mountain states, the limited water resources combined with the precarious physical environment are constant constraints of present and future growth in the area. Trends affecting these states are increasing population through westward migration, increasing urbanization and rural decline, increasing industrialization with new values and behavior patterns, and increasing concern with ecological mismanagement. shortages are expected by the year 2020 with continuing population and urban growth. Water management becomes an important means of controlling, coordinating, and allocating the existing and future rights to the use of water, and thus offers the opportunity for the achievement of larger goals of a social policy for concerted land development. Choices involved are either total use brought into line with supply or one type of use might be sacrificed to maintain another. Use of water through federal projects for agriculture in formerly arid lands while moisture-rich areas of the country exist is increasingly questioned. Interstate rivalry for water may be expected. The future of the region depends on both augmenting the natural supplies and developing alternative means for meeting competing demands. The policy for maximizing water supplies hinges on strong incentives for efficient or new uses including economic benefits, and redefinition of the doctrine of beneficial use; structural changes such as new organizational arrangements, creation of new state agencies; and regulatory counter-incentives such as stricter enforcement and pricing policies. Other policies which can supplement water as a means of controlling growth are suggested. (Edwards-North W74-04505

SYRACUSE METROPOLITAN AREA COM-PREHENSIVE PLAN-WATER AND SEWER PLAN AND SERVICES ALLOCATION PLAN, Syracuse-Onondaga County Planning Agency, For primary bibliographic entry see Field 5D. W74-04507

PRATTVILLE, ALABAMA COMMUNITY DEVELOPMENT PLAN, VOL. II: SUMMARY AND ILLUSTRATIONS.
Central Alabama Regional Planning and Develop-

ment Commission, Montgomery. For primary bibliographic entry see Field 5D. W74_04508

ECONOMIC ASPECTS OF GROUND WATER RESOURCES AND REPLACEMENT FLOWS IN SEMIARID AGRICULTURAL AREAS, New Mexico Univ., Albuquerque For primary bibliographic entry see Field 4B. W74-04563

THE OPERATION OF A STREAM-AQUIFER SYSTEM UNDER STOCHASTIC DEMANDS, Geological Survey, Reston, Va. For primary bibliographic entry see Field 4B. W74-04808

EVALUATION OF THE USE OF PRICING AS A TOOL FOR CONSERVING WATER, George Washington Univ., Washington, D.C. Dept. of Management Sciences.
For primary bibliographic entry see Field 3D. W74-04810

6E. Water Law and Institutions

A STUDY OF WATER INSTITUTIONS IN UTAH AND THEIR INFLUENCE ON THE PLANNING, DEVELOPING, AND MANAGING OF WATER

Utah Center for Water Resources Research.

Available from National Technical Information Service as PB-227 914 \$3.75 in paper copy, \$1.45 in microfiche. Completion Report, Utah Research Laboratory Publication PRWG79-1, September 1973. 54 p. 5 fig. 3 tab, 123 ref. OWRR B-037-UTAH(1). 14-31-0001-3134-OWRR.

*Water policy, *Irrigation districts, *Management, Water allocation(Policy), Water Supply Development, Water Distribution(Applied), Political aspects, Legal *Utah, aspects. Water law, Planning. Institutional restraints.

Identifiers: Wasatch Front(Utah), Municipal water companies, Conservancy districts, Private water companies.

The various water institutions in Utah are examined with respect to their history, purpose, legal status, organizational structure, management system, financial arrangement and service responsibility. The restraints that each type of institution has upon the overall state planning effort are identified and critically examined. Emphasis is given to those institutions in the Wasatch front area of Utah where pressures of urbanization and industrialization are increasing. Specific details are given for the mutual water companies, irrigation districts, private companies, municipal water companies, and conservancy districts in Utah and Weber Counties. W74-04316

Field 6-WATER RESOURCES PLANNING

Group 6E-Water Law and Institutions

SOUTHWESTERN GROUNDWATER LAW: A TEXTUAL AND BIBLIOGRAPHIC INTERPRETATION,

Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 4B.

For primary biblio

INTERNATIONAL DECADE OF OCEAN EX-

National Science Foundation, Washington, D.C. Office for the International Decade of Ocean Exploration.

Publication NSF-34, Washington, D C, October 1971. 64 p, 29 fig, append.

Descriptors: *Oceanography, development, *International commissions, *International waters.

Identifiers: *International decade of ocean exploration.

The International Decade of Ocean Exploration is dedicated to gaining sufficient knowledge about the ocean to provide: scientific capability leading to accurate long-term environmental forecasting; scientific background necessary for the rational management of the living and nonliving resources of the sea; warning when man's activities endanger the environment and himself; and the scientific basis necessary for the formulation of sound international decisions on marine affairs. The United States programs for the contribution to the initial phase of the International Decade of Ocean Exploration is described. (Knapp-USGS)

WHAT DO WE MEAN BY METROPOLITAN WATER MANAGEMENT INSTITUTIONS., Colorado State Univ., Fort Collins.

N. Wengert. Water Resources Bulletin, Vol 9, No 3, p 512-521, June 1973. 24 ref. OWRR W-122(No 3183)(4).

Descriptors: Water resources, *Institutions, *Planning, *Organizations, Values, *Reviews, National Water Commission, *Institutional constraints, *Social values, *Cities, Urbanization. Identifiers: Definition, Meaning, Institutional fragmentation, Norms, Usage, Literature review, Water resources council, Great Lakes Basin Commission.

Usages and meaning of the term 'institutions' are often unclear, and many conceptualizations exist. Among the findings of this state-of-the-art survey were that: (1) many used do not include careful definitions; (2) many users seemed unaware of the general, theoretical literature on institutions; (3) there was little consistency among uses, either in practical literature dealing with water problems, or in conceptual literature dealing with water problems, or in conceptual literature dealing with the theory of institutions; (4) some usages of the term were without significant meaning; (5) the term was often used as a king of 'black box' to account for behavioral, societal, or managerial factors recognized as being of possible relevance; (6) the term often was used as a synonym for 'organization' in the narrowest sense of administrative structure. Changes in institutions are frequently superficial unless they are related to fundamental changes in attitudes, perceptions, and expectations of the affected citizens. Institutions are not simply the current organizational pattern but include socio-political values (norms). The local water agency is not an institution, but the collectivity or structure around which are clustered the institutionalized means for planning, developing and managing water functions. A proposed definition is the structured result or outcome of a process by which values are articulated, arranged and communicated, having continuity over time, and influencing or controlling behavior of persons involved with it, who did not necessarily participate in formulating those values (norms). (Edwards - North Carolina)

STATE ENVIRONMENTAL MANAGEMENT, CASE STUDIES OF NINE STATES, For primary bibliographic entry see Field 5G. W74-04503

ENVIRONMENTAL QUALITY, THE FOURTH ANNUAL REPORT OF THE COUNCIL ON EN-VIRONMENTAL QUALITY. Council on Environmental Quality, Washington,

D.C.
For primary bibliographic entry see Field 5G.

W74-04504

6F. Nonstructural Alternatives

INSTITUTIONAL FRAMEWORK AFFECTING THE USE OF INLAND WETLANDS IN MAS-SACHUSETTS.

SACHUSETTS,
Massachusetts Univ., Amherst. Dept. of Agricultural and Food Economics.
For primary bibliographic entry see Field 4A.

FLOOD PROOFING DECISIONS UNDER UN-

CERTAINTY: AN APPLICATION TO THE CON-NECTICUT RIVER BASIN, Massachusetts Univ., Amherst. Dept. of Agricul-

tural and Food Economics. For primary bibliographic entry see Field 6A. W74-04463

6G. Ecologic Impact Of Water Development

A DETAILED INVESTIGATION OF THE SOCIOLOGICAL, ECONOMIC, AND ECOLOGICAL ASPECTS OF PROPOSED RESERVOIR SITES IN THE SALT RIVER BASIN OF KENTUCKY.

Kentucky Water Resources Inst., Lexington. For primary bibliographic entry see Field 2A. W74-04310

STATE ENVIRONMENTAL MANAGEMENT, CASE STUDIES OF NINE STATES, For primary bibliographic entry see Field 5G. W74-04503

ENVIRONMENTAL QUALITY, THE FOURTH ANNUAL REPORT OF THE COUNCIL ON ENVIRONMENTAL QUALITY.

Council on Environmental Quality, Washington,
D.C.

Ever primary hibliographic entry see Field SG

For primary bibliographic entry see Field 5G. W74-04504

MANAGING GROWTH IN A FRAGILE ENVIRONMENT: PROBLEMS OF THE ROCKY MOUNTAIN STATES, Colorado State Univ., Fort Collins.

For primary bibliographic entry see Field 6D. W74-04505

REVIEWING ENVIRONMENTAL IMPACT STATEMENTS-POWER PLANT COOLING SYSTEMS, ENGINEERING ASPECTS, Pacific Northwest Environmental Research Lab..

Corvallis, Oreg. For primary bibliographic entry see Field 5G. W74-04555

7. RESOURCES DATA

7A. Network Design

LINEAR SYSTEMS TECHNIQUE APPLIED TO HYDROLOGIC DATA ANALYSIS AND INSTRUMENT EVALUATION: A CASE STUDY ON DATA FROM THE ALICE SPRINGS AREA, Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Land Research. For primary bibliographic entry see Field 2A. W74-04470

TOPOLOGY OF RIVER SYSTEMS AND HYDROGRAPHIC INDICATOR STUDIES (TOPOLOGIYA RECHNYKH SISTEM I GIDROGRAFICHESKIYE INDIKATSIONNYYE ISSLEDOVANIYA), For primary bibliographic entry see Field 2A. W74-04578

7B. Data Acquition

REMOTE SENSING IN SAMPLING SITE LOCA-TION IN LAKES AND STREAMS, Kentucky Univ., Lexington. Dept. of Civil Engineering. For primary bibliographic entry see Field 5A. W74-04313

A GEOECOLOGICAL TERRAIN ANALYSIS OF DISCONTINUOUSLY FROZEN GROUND IN THE UPPER MACKENZIE RIVER VALLEY, CANADA,
Department of the Environment, Edmonton (Alberta).
For primary bibliographic entry see Field 2C.
W74-04344

IN SITU PHYSICOMECHANICAL PROPERTIES OF PERMAFROST USING GEOPHYSICAL TECHNIQUES, Iron Ore Co. of Canada, Schefferville (Quebec). For primary bibliographic entry see Field 2C. W74-04392

THE APPLICATION OF SHALLOW SEISMIC METHODS TO MAPPING OF FROZEN SURFICIAL MATERIALS, Geological Survey of Canada, Ottawa (Ontario). For primary bibliographic entry see Field 2C. W74-04401

INVESTIGATION OF SAMPLING PERENNI-ALLY FROZEN ALLUVIAL GRAVEL BY CORE DRILLING, Cold Regions Research and Engineering Lab., Hanover, N.H. For primary bibliographic entry see Field 2C. W74-04402

POTENTIAL USE OF AIRBORNE DUAL-CHAN-NEL INFRARED SCANNING TO DETECT MAS-SIVE ICE IN PERMAFROST, Development and Resources Transportation Co., Silver Spring, Md. L. A. LeSchack, F. H. Morse, W. R. Brinley, Jr., N. G. Ryan, and R. B. Ryan.

In: International Conference on Permafrost 2nd, Yakutsk, USSR 1973. p 542-549, 1973. 6 fig, 10 ref.

Descriptors: *Permafrost, *Frozen ground, *Ice, *Remote sensing, *Arctic, Frozen soils, Infrared radiation, Temperature, Surveys, Mapping, Aerial photography.

Remote sensing can detect the thermal effects on the surface of ice as they are manifested in the upper 2.5c3 m of permafrost. This is borne out by field work. Predawn imagery appeared to have the greatest significant information. Polygons undetected by conventional reconnaissance means are detected by IR scanning. The existence of polygons, with their associated ice wedges, may be determined with greater confidence than be determined with greater confidence than heretofore possible in areas of discontinuous permafrost or in areas where there is no visible surface expression. Dual-channel IR scanning offers even greater capabilities of identifying such ice masses. By obtaining a product of the two signals and mapping the resultant signal, images of polygonal structures appear to be enhanced significantly. By taking a ratio of the same two signals, imagery approaching an emissivity ratio map is produced in which the temperature function is significantly attenuated. A comparison of the product and ratio maps suggests that the polygonal structures seen are thermal anomalies and not anomalies due to surface emissivity change. (See also W74-04346) (Knapp-USGS) W74-04403

MASS SPECTROMETRY AND INHOMOGENE-

OUS ION OPTICS, Rensselaer Polytechnic Inst., Troy, N.Y. For primary bibliographic entry see Field 5A.

AIR POLLUTION MEASUREMENTS FROM

General Dynamics, San Diego, Calif. Convair Aerospace Div. For primary bibliographic entry see Field 5A. W74-04485

SCANNING ELECTRON MICROSCOPY OF FIXED, FROZEN, AND DRIED PROTOZOA, Illinois Univ., Urbana. Dept. of Zoology E. B. Small, and D. S. Marszalek. Science, Vol 163, p 1064-1065, March 7, 1969. 8 fig, 9 ref. OWRR B-028-III (2).

Descriptors: *Freeze drying, *Electron microsco-py, *Sampling, *Protozoa, Freezing, Dehydration. Identifiers: *Scanning electron microscopes.

Selected protozoa were examined with a scanning electron microscope. The natural shape of the body and surface organelles were revealed. Chemical fixation and freeze-drying techniques described permit a new approach to the study of protozoa. (Knapp-USGS)
W74-04497

CENTO SEMINAR ON THE APPLICATION OF REMOTE SENSORS IN THE DETERMINATION OF NATURAL RESOURCES.

Central Treaty Organization, Ankara (Turkey). Proceedings of Seminar on the Application of Remote Sensors in the Determination of Natural Resources; Ankara, Turkey, November 10-13, 1971: Office of the U.S. Economic Coordinator for Central Treaty Organization Affairs, Ankara, Turkey, 1972. 179 p.

Descriptors: *Remote sensing, *Hydrology, *Water resources, Hydrogeology, Data collections, Mapping, Water resources development, Satellites(Artificial), *Natural resources. Identifiers: *CENTO.

CENTO sponsored this Seminar on the Application of Remote Sensors in the Determination of Natural Resources. The fast, accurate, and timely acquisition of multidisciplinary data from space platforms will facilitate a better monitoring of time-dependent events such as land utilization, crop vigor, salinization, groundwater fluctuations, castal line denudation, and erosion control. The scientific and technological communities of the CENTO region are in a position to deal effectively with the complexities of modern technology. The seminar was held in Ankara, Turkey from Wednesday, November 10 to Saturday, November 13, 1971. (See W74-04568 thru W74-04570) (Knapp-W74-04567

POSSIBLE APPLICATION OF REMOTE SENSING FOR UNDERGROUND WATER EXPLORATION IN TURKEY, State Hydraulic Works, Ankara (Turkey). Dept. of Hydrographic Mapping and Photo Geology. N. Atuk.

In: Proceedings of CENTO Seminar on the Application of Remote Sensors in the Determination of Natural Resources; Ankara, Turkey, November 10-13, 1971; Office of the U.S. Economic Coordinator for Central Treaty Organization Affairs, p

Descriptors: *Remote sensing, *Hydrogeology, Surveys, Mapping, Satellites(Artificial), Data collections, *Groundwater, *Exploration. Identifiers: *Turkey.

In 1952, a small groundwater office was formed for the studies of exploration, development, control, and determination of quality and quantity of groundwater in Turkey. Groundwater investiga-tions are made by photo interpretations to obtain hydrologic features, thus decreasing the amount of field work necessary and obtaining nearly correct data results. The remote sensing studies un-dertaken by NASA are of interest to Turkey. Three large regions have been selected to: (1) evaluate the utilization of data obtained from space; (2) investigate the possibility of obtaining economically important results on some interpreted problems; (3) correlate and develop the technique of interpretation from the data obtained through field work, aircraft, and satellite: (4) examine streams and submarine springs with respect to tidal phenomena or deformations occurring along seashore lines: (5) investigate and follow the change of stream meanders, boundaries of surface water, and groundwater levels, and to investigate soil, vegetation, and moisture conditions; (6) follow exposure of the vegetation cover in time; and (7) examine the matters in relation to geological problems of Turkey. (See also W74-04567) (Knapp-USGS) W74-04568

GROUNDWATER INVESTIGATION MANAGEMENT IN IRAN, Ministry of Water and Power, Tehran (Iran). J. Miri-Lavasani. AND

In: Proceedings of CENTO Seminar on the Application of Remote Sensors in the Determination of Natural Resources; Ankara, Turkey, November 10-13, 1971: Office of the U.S. Economic Coordinator for Central Turkey Organization Affairs, p

Descriptors: *Groundwater, *Data collections, *Remote sensing, *Hydrogeology, Investigations, *Subsurface investigations. Identifiers: *Iran.

Groundwater studies in Iran are briefly outlined, and the uses of remote sensing in these studies are described. The investigations are in covering a total area of more than 80,000 sq km. Data are collected from over 10,800 qanats, 9,000 deep wells, 18,850 shallow wells, 1,900 springs, and 3,000 observation wells.(See also W74-04567) (Knapp-USGS) W74-04569

OPERATIONAL AND EXPERIMENTAL REMOTE SENSING IN HYDROLOGY, Geological Survey, Washington, D.C. Office of Remote Sensing. M. Deutsch.

In: Proceedings of CENTO Seminar on the Application of Remote Sensors in the Determination of Natural Resources; Ankara, Turkey, November 10-13, 1971: Office of the U.S. Economic Coordinator for Central Treaty Organization Affairs, p 95-105, 1972. 11 fig, 1 tab, 6 ref.

Descriptors: *Remote sensing, *Hydrology, *Water resources, Hydrogeology, Data collec-tions, Mapping, Water resources development, Satellites(Artificial).

Both dynamic and nondynamic hydrologic phenomena can be investigated and better un-derstood through the use of remote-sensing techniques. Operational techniques utilizing air-craft and/or spacecraft data provide qualitative observations and quantitative measurements in three modes--spatial, temporal, and spectral. Among the operational applications of remote sensing to hydrology are flood plain mapping, location and description of geologic structures con-trolling groundwater movement, identification of phreatophytes, monitoring of water losses and groundwater, and thermal infrared studies. Many experimental applications of remote sensing to hydrologic phenomena have been proposed for the Earth Resources Technology Satellite. These in-clude experiments in playa lake dynamics, determination of density and distribution of phreatophytes, flood plains and wetland mapping, and spring runoff forecasting. Such hydrologic and spring runoff forecasting. Such hydrologic studies will yield significant benefit to worldwide water resources management programs by providing a data base for future planning and dement. (See also W74-04567) (Knapp-USGS) W74-04570

RADIO DEPTH-SOUNDING ON MEIGHEN AND BARNES ICE CAPS, ARCTIC CANADA,
Department of the Environment, Ottawa,
(Ontario). Inland Waters Directorate. For primary bibliographic entry see Field 2C. W74-04571

DETERMINATION OF SOIL MOISTURE BY REMOTE SENSING TECHNIQUES (OPREDELENIYE VLAZHNOSTI POCHVY DISTANTSIONNYMI AEROKOSMICHESKIMI

DISTANISMOSTORIA METODAMI), Akademiya Nauk SSSR, Moscow. Institut

For primary bibliographic entry see Field 2G. W74-04576

WATER RESOURCES APPLICATIONS.

Geological Survey, Rolla, Mo. Water Resources Div.

J. F. Daniel.

In: Proceedings of Seminar in Applied Remote Sensing, May 8-12, 1972, Des Moines, Iowa: Iowa Geological Survey Public Information Circular No 3, p 176-181, September 1972. 1 tab.

Descriptors: *Remote sensing, Hydrogeology, *Aerial photography, Satellites(Artificial), Water resources, Mapping, *Surveys, Groundwater movement, Water yield improvement.

Small scale multispectral photography may be considered an important tool for hydrology. The imagery may be useful for determining possible locations of large groundwater quantities, studying groundwater movement, determining stream gaging location, and locating optimal placement of dam sites. (Knapp-USGS) W74-04584

ANALYTICAL TECHNIQUES FOR THE DETERMINATION OF PETROLEUM CONTAMINATION IN MARINE ORGANISMS, Woods Hole Oceanographic Institution, Mass. For primary bibliographic entry see Field 5A. W74-04594

Field 7—RESOURCES DATA

Group 7B-Data Acquition

HYDROLOGIC INVESTIGATION AND DESIGN IN URBAN AREAS--A REVIEW,
Snowy Mountains Engineering Corp., Cooma Snowy Mo (Australia). For primary bibliographic entry see Field 2A. W74-04597

A BACTERIOLOGICAL PRESSURE-RETAIN-ING DEEP-SEA SAMPLER AND CULTURE

Woods Hole Oceanographic Institution, Mass. For primary bibliographic entry see Field 5A.

NUCLEONIC SEDIMENT CONCENTRATION GAUGE - COMPARISON OF TRANSMISSION AND SCATTERING MODES,

Bhabha Atomic Research Centre, Bombay (India). Isotope Div. For primary bibliographic entry see Field 2J.

7C. Evaluation, Processing and **Publication**

A THREE-DIMENSIONAL MODEL FOR ESTUARIES AND COASTAL SEAS: VOLUME I, PRINCIPLES OF COMPUTATION, RAND Corp., Santa Monica, Calif. For primary bibliographic entry see Field 2L. W74-04301

COMPLETE LISTING OF PROGRAM DESCRIBED IN OPTIMAL OPERATION OF PROGRAM MULTI-RESERVOIR WATER SYSTEMS.

Texas Univ., Austin. Center for Research in Water Resources. For primary bibliographic entry see Field 4A.

W74-04315

A REFRACTION STUDY AND PROGRAM FOR PERIODIC WAVES APPROACHING A SHORELINE, AND EXTENDING BEYOND THE

BREAKING POINT, Delaware Univ., Newark. Coll. of Marine Studies. For primary bibliographic entry see Field 8B. W74-04340

A GENERAL SOLUTION FOR THE TWO-DIMENSIONAL, TRANSIENT HEAT CONDUCTION PROBLEM IN PERMAFROST, USING IMPLICIT, FINITE DIFFERENCE METHODS, Brown and Root, Inc., Houston, Tex. For primary bibliographic entry see Field 2C.

INDIRECT MAPPING OF THE SNOWCOVER FOR PERMAFROST PREDICTION AT SCHEF-FERVILLE, QUEBEC, McGill Univ., Schefferville (Quebec). McGill Sub-Arctic Research Lab.

For primary bibliographic entry see Field 2C. W74-04356

SAMPLE DISTURBANCE AND THAW CON-SOLIDATION OF A DEEP SAND PER-

Woodward-Lundgren and Associates, Oakland, Calif. For primary bibliographic entry see Field 2C. W74-04387

MAPPING AND PREDICTING PERMAFROST IN NORTH AMERICA: A REVIEW, 1963-1973, Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 2C. W74-04398

ELECTROMAGNETIC PROBING OF PER-

Cold Regions Research and Engineering Lab., Hanover, N.H. For primary bibliographic entry see Field 2C. W74-04400

THE NEED OF GEOLOGICAL INVESTIGA-TIONS FOR THE DEVELOPMENT OF THE GROUND WATER RESOURCES OF THE REPUBLIC OF KOREA, Geological Survey, Reston, Va. Water Resources

For primary bibliographic entry see Field 4B.

QUANTITY AND CHEMICAL QUALITY OF LOW FLOW IN THE EAST FORK SAN JACIN-TO AND WEST FORK SAN JACINTO RIVERS NEAR HOUSTON, TEXAS, JUNE 24, 26, 1969, Geological Survey, Austin, Tex. For primary bibliographic entry see Field 5B. W74-04481

EFFECTS OF URBANIZATION ON FLOODS IN THE DALLAS, TEXAS, METROPOLITAN AREA,

Geological Survey, Austin, Tex. For primary bibliographic entry see Field 4C. W74-04483

EVALUATION AND SIMULATION OF CHEMI-CAL-QUALITY DATA FOR FIVE MONTANA SAMPLING STATIONS, Geological Survey, Helena, Mont. For primary bibliographic entry see Field 2K. W74-04484

SPECIAL ANALYSIS OF SHORT INERTIAL-IN-

TERNAL WAVE RECORDS,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate. For primary bibliographic entry see Field 2E. W74-04489

SURFACE-WATER AVAILABILITY, DERDALE COUNTY, ALABAMA, Geological Survey, University, Ala. For primary bibliographic entry see Field 2E. AVAILABILITY, LAU-

RECONNAISSANCE OF THE GROUND-WATER RESOURCES OF CIMARRON COUNTY, OKLAHOMA.

Geological Survey, Washington, D.C. For primary bibliographic entry see Field 4B. W74-04495

LAKES IN THE BOULDER-FORT COLLINS-GREELEY AREA, FRONT RANGE URBAN CORRIDOR, COLORADO, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 2H. W74-04496

VISCOSITY MEASUREMENTS OF WATER IN REGION OF ITS MAXIMUM DENSITY, Department of the Environment, (Ontario). Inland Waters Directorate. For primary bibliographic entry see Field 2K. W74-04518

CENTO SEMINAR ON THE APPLICATION OF REMOTE SENSORS IN THE DETERMINATION OF NATURAL RESOURCES.

Central Treaty Organization, Ankara (Turkey). For primary bibliographic entry see Field 7B.

OPERATIONAL AND EXPERIMENTAL REMOTE SENSING IN HYDROLOGY, Geological Survey, Washington, D.C. Office of **OPERATIONAL** Remote Sensing.
For primary bibliographic entry see Field 7B.
W74-04570

RESERVOIRS OF EUROPE AND SOME ASPECTS OF THEIR CONSTRUCTION AND MULTIPURPOSE USE MULTIPURPOSE USC (VODOKHRANILISHCHA ZARUBEZHNOY YEVROPY I NEKOTORYYE VOPROSY IKH SOZDANIYA I KOMPLEKSNOGO ISPOL'ZOVANIYA), Akademiya Nauk SSSR, Moscow. Institut Vod-nykh Problem.

For primary bibliographic entry see Field 8A. W74-04582

THE EFFECT OF COLLECTING TIME AND GRAIN SIZE ON THE SAMPLING OF STREAM GRAIN SIZE ON THE SAMPLING OF STREAM SEDIMENTS FOR GEOCHEMICAL MAPPING IN THE ST. CATHARINES AREA, ONTARIO, Brock Univ., St. Catharines (Ontario). Dept. of Geological Sciences. For primary bibliographic entry see Field 2J.

W74-04587

A NUMERICAL CLASSIFICATION OF SELECTED LANDSLIDES OF THE DEBRIS SLIDE-AVALANCHE-FLOW TYPE, Macquarie Univ., North Ryde (Australia). School of Earth Sciences For primary bibliographic entry see Field 2J. W74-04591

CHEMICAL QUALITY OF STREAMS, AL-CHEMICAL QUALITY OF STREAMS, AL-LEGHENY RIVER BASIN AND PART OF THE LAKE ERIE BASIN, NEW YORK, Geological Survey, Albany, N.Y. For primary bibliographic entry see Field 2K. W74-04593

GROUND-WATER DATA FOR HARRIS COUN-TY, TEXAS: VOLUME I. DRILLERS' LOGS OF WELLS. 1905-71. Geological Survey, Austin, Tex. For primary bibliographic entry see Field 4B. W74-04602

WATER QUALITY RECORDS FOR THE HUB-BARD CREEK WATERSHED, TEXAS, OCTOBER 1969-SEPTEMBER 1972. Geological Survey, Austin, Tex. For primary bibliographic entry see Field 5B. W74-04606

THE ANALYSIS OF HARBOR AND ESTUARY SYSTEMS, California Univ., Berkeley. Coll. of Engineering. For primary bibliographic entry see Field 2L. W74-04745

AN INEXPENSIVE S.T.D. DATA LOGGING SYSTEM, National Inst. of Oceanography, Wormley (England). G. F. Morrison. Deep-Sea Research, Vol 20, No 7, p 665-668, July 1973. 4 fig, 1 ref.

Descriptors: *Data storage and retrieval, Salinity, Temperature, Depth, Analog computers, Electronic equipment.
Identifiers: *Tape recorders.

An inexpensive and convenient method is described for storing and retrieving frequency modulated signals in the audio frequency band. The signal is recorded on one channel of

stereophonic tape with a crystal derived clock frequency on the other. During retrieval the clock frequency is increased in a phase locked loop and is used as an external standard for a commercial counter/timer which measures the period of the signal in terms of this reference. The system has been used to record salinity, temperature and depth data from the Plessey Environmental System instrument, and this application is discussed. (Mortland-Battelle) W74-04772

IDENTIFICATION OF BACTERIA BY COM-PUTER: THEORY AND PROGRAMMING, Central Public Health Lab., London (England). National Collection of Type Cultures. For primary bibliographic entry see Field 5A. W74-04791

CHARACTERISTICS OF STREAMFLOW AT GAGING STATIONS IN THE LOUP RIVER BASIN, NEBRASKA, Geological Survey, Lincoln, Nebr. For primary bibliographic entry see Field 2E. W74-04794

SURFACE- AND GROUND-WATER CONDI-TIONS DURING 1959-61 IN A PART OF FLETT CREEK BASIN, TACOMA, WASHINGTON, Geological Survey, Tacoma, Wash. For primary bibliographic entry see Field 2E. W74 04704

HYDROLOGIC DATA FOR SMALL RURAL CATCHMENTS IN AUSTRALIA, 1973, Snowy Mountains Engineering Corp., Cooma (Australia). For primary bibliographic entry see Field 2E. W74-04842

MISSISSIPPIAN AQUIFER OF IOWA. Geological Survey, Iowa City, Iowa. P. J. Horick Iowa Geological Survey Miscellaneous Map Series 3, 1973. 3 sheets, 13 fig, 4 tab, 3 map, 10 ref.

Descriptors: *Hydrogeology, *Aquifers, *Iowa, *Hydrologic data, Maps, Data collections, Water quality, Water levels, Water yield, Groundwater. Identifiers: *Mississippian aquifer(Iowa).

The purpose of this 3-sheet atlas is to present information on the occurrence, movement, availability, use, and chemical quality of water from the Mississippian aquifer in lowa. Included is a brief description of the physical characteristics and spatial relations of the rocks that contain the water. Also discussed and evaluated are the areas of high Also discussed and evaluated are the areas of high pollution hazard to this and underlying aquifers. The Mississippian aquifer underlies about 60% of the State, but in only about 15% of this area can the aquifer be considered a major source of potable water. This area comprises all or parts of 10 counties in the north-central part of the Mississippian outcrop, where the aquifer will yield moderate to large supplies of good to excellent quality water to wells. Estimates of recharge and storage in that region indicate that many times the current withdrawal rate of about 12 mgd can be storage in that region indicate that many times the current withdrawal rate of about 12 mgd can be developed from the aquifer. Elsewhere, the aquifer yields either small quantities of moderately to highly mineralized water (subcrop area), or small to moderate quantities of fair to good quality water (southeast outcrop area). Additional supplies probably can be developed in both areas. Wastedisonal sites in the outcrop area of the waste-disposal sites in the outcrop area of the aquifer would be best located where the glacial drift is thick or has very low permeability. A potential contamination hazard to the underlying Cambrian-Ordovician aquifer exists in the subcrop area of the Mississippian aquifer. In that area the Mississippian aquifer contains highly mineralized water. (Knapp-USGS) W74-04843

8. ENGINEERING WORKS

8A. Structures

MECHANICAL BYPASSING OF LITTORAL DRIFT AT INLETS, Corps of Engineers, Washington, D.C. Beach Ero-For primary bibliographic entry see Field 2L. W74-04337

APPROACHES TO STORMWATER MANAGE-

Hittman Associates, Inc., Columbia, Md. For primary bibliographic entry see Field 5A. W74-04458 RESERVOIRS OF EUROPE AND SOME ASPECTS OF THEIR CONSTRUCTION AND MIII TIDIIDDOCE TICE

USE
ZARUBEZHNOY
YEVROPY I NEKOTORYYE VOPROSY IKH
SOZDANIYA I KOMPLEKSNOGO
ISPOL'ZOVANIYA),
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
V. A. Sharanov A. Sharapov.

Vodnyye Resursy, No 3, p 175-186, 1973. 5 fig, 3 tab, 44 ref.

Descriptors: *Europe, *Reservoirs, *Multiple-pur-pose reservoirs, *Reservoir construction, Reser-voir design, Reservoir sites, Reservoir operation, Reservoir storage, Maps. Identifiers: USSR.

The number, basic parameters, dynamics of construction, and geographical distribution of reservoirs in Europe, excluding the Soviet Union, are tabulated and mapped. The economic importance of these reservoirs and general aspects of reservoir design, construction, and operation are examined. Gosefson-USGS)
W74-04582

APPLICATION OF FLUORESCENT COATED SAND IN LITTORAL DRIFT AND INLET STU-

Florida Univ., Gainesville. Dept. of Coastal and Oceanographic Engineering. For primary bibliographic entry see Field 2L. W74-04616

THE ATLANTIC COAST OF LONG ISLAND. Army Engineer District, New York. F. L. Panuzio

In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968, American Society of Civil Engineers, Vol 2, Part 4, Chap 77, p 1222-1241, 1969. 7 fig, 2 tab, 15 ref, 1 plate

Descriptors: *Sea level, *Storms, *Littoral drift, *Shore protection, *New York, Coasts, Barriers, Inlets(Waterways), *Sediment transport, *Coastal engineering, *Design criteria. Identifiers: Long Island(NY).

The south shore of Long Island, located on the northeast coast of the United States, consists of 120 miles of headlands and barrier beach which is breached by inlets that interconnect the coastal bays with the Atlantic Ocean. The shore is subject to severe changes due to constant attack of the ocean, rising level of the ocean and severe storms. The predominant, east to west littoral drift moves from 300,000 to 600,000 cubic yards of sand along the shore annually. The affected area encompasses a million people and is valued at \$2.5 billions. Improvements have been authorized for 110 miles of shore, and involve sandfill, feeder beaches, groins, jetties, sand bypassing, and inlet

barriers. The estimated cost for the entire shore improvement is \$188 million. The annual charges are about \$10 million. The annual benefits are \$16 million. The implementation of the authorized work includes the design and model testing of several sections and the completed work in several sections, such as sandfill, feeder beaches, and groins. The completed work shows considerable effect on shore processes. Overall evaluation must await completion of the total improvement in an integral section of the shore. (Sinha-OEIS) W74-04629.

8B. Hydraulics

THE SOLITARY WAVE,

R. L. Wiegel. In: Oceanographical Engineering, Chapter 3, p 65-76, 1964. 19 fig, 24 ref. Prentise Hall, New York,

Descriptors: *Waves(Water).
Identifiers: *Solitary waves, *Cnoidal waves, Shoaling.

The solitary wave is not oscillatory in character in that there is no reversal of flow of the water particles because it is a wave of translation; nor is there a trough, all of the wave being above the undisturbed water level. The solitary wa ve is said to be a limiting case of cnoidal wave. Explanations are given on processes in shoaling water, on reflection- the Mach-Stem effect, and finally on diffraction. (Sinha-OEIS) W74-04326

MIXING PROCESSES, For primary bibliographic entry see Field 5B. W74-04327

MEAN DIRECTION OF WAVES AND OF WAVE

ENERGY, Leeds, Hill and Jewett Inc., Los Angeles, Calif. For primary bibliographic entry see Field 2J. W74-04328

THE RELATIONSHIP BETWEEN WAVE ACTION AND BEACH PROFILE CHARACTERISTICS, University Coll., London (England). Dept. of Civil

Engineering.
For primary bibliographic entry see Field 2J.
W74-04331

WAVE EFFECT ON THE COAST FORMATION

AND EROSION, Construction Engineering Inst., Warsaw (Poland). For primary bibliographic entry see Field 2J. W74-04335

THEORETICAL FORMS OF SHORELINES, Rijkswaterstaat-Deltadienst, The (Netherlands). Coastal Research Dept. For primary bibliographic entry see Field 2J. W74-04336

WAVES IN SHOALING WATER.

R. L. Wiegel.

In: Oceanographical Engineering, Chapter 7, p 150-179, 1964. 34 fig, 41 ref. Prentise Hall, New York, NY, Price: \$24.75.

Descriptors: Coasts, *Waves(Water), *Shallow water, *Refraction(Water waves), Reflection, water, *Refr Surf, *Shoals. Identifiers: *Shoaling, *Breaking waves.

Following a statement on the transformation of uniform periodic waves, the transformation of ir-regular waves is examined. The linear least-

Field 8—ENGINEERING WORKS

Group 8B-Hydraulics

squared method of prediction of wave motion is reviewed. Wave refraction techniques are usually valuable in obtaining reliable quantitative information for large portions of the area under study and will give qualitative information about a complex area. Wave refraction is applied in the case of a straight shore with parallel contours, in the case of islands and shoals with concentric circular conislands and shoals with concentric circular con-tours, and the region of a caustic. Instructions are given on the graphical construction of refraction diagrams by the wave-front method for long-crested waves, and by use of orthogonals. The ad-vantages and disadvantages of the use of both methods are set forth. Breakers, surf and multi-crested waves, also are discussed. (Sinha-OEIS) W74-04338

SHORES AND SHORE PROCESSES, For primary bibliographic entry see Field 2L. W74-04339

A REFRACTION STUDY AND PROGRAM FOR PERIODIC WAVES APPROACHING A SHORELINE, AND EXTENDING BEYOND THE

BREAKING POINT, Delaware Univ., Newark. Coll. of Marine Studies. B. S. L. Smith, and F. E. Camfield. Available from NTIS as AD-756 636 for \$3.00

paper copy, \$1.45 microfiche. Technical Report No. 16, CMS No. 2 EN-071, November 1972. 124 43 fig, 7 tab, 25 ref, 6 append. ONR-N00014-69-

Descriptors: *Coasts, *Refraction(Water waves), *Waves(Water), *Shallow water, *Computer programs, Shoals, *Delaware. Identifiers: Breaker zone, Shoaling zone, *Cape Henlopen(Del.).

The study extends the computerized wave refraction process beyong the breaking zone and over shoaling areas. It applies experimental data to the irregular conditions encountered in shoaling areas in such a way that a manageable and reliable program is achieved. This is done by means of graphi-cal interpretation and mathematical treatment. The program was run for three conditions of wave period and a constant deep water wave height of 10 feet. The chosen direction was from the E.S.E., being one of predominant wind for the Cape Henlopen area. The program refracts successfully out-side and beyond the shoaling area, and estimates reforming wave heights and wavelengths of a reasonable order. These compute all the way to the shoreline to give the wavelengths and heights at the beach, thus providing valuable infor-mation for design purposes. The program was also run over an artificially constructed breaker zone of exaggerated undulation, and ran successfully. Program details and results are given. (Sinha-OEIS) W74-04340

MODIFICATION OF NEARSHORE CURRENTS BY COASTAL STRUCTURES, United States Lake Survey, Detroit, Mich.

J. H. Saylor. Available from NTIS as AD-646 820, for \$6.00 paper copy, \$1.45 microfiche. Miscellaneous Paper No. 66-1, June 1966. 14 p, 9 fig, 9 ref.

Descriptors: *Great Lakes, Lakes, *Coastal structures, *Harbors, *Currents(Water), *Circulation, Breakwaters, Lake Superior, Lake Erie, Lake Michigan, Shear stress, Winds, Water circulation, *Wind tides. Identifiers: Longshore currents, Flushing.

Nearshore, Wind driven currents.

The results of water current studies conducted along the shores of Lakes Superior, Michigan, and Erie are described. Studies were made at various harbor locations to establish current magnitudes and patterns within the harbors and in the adjacent coastal areas, and to relate the measured currents with the causitive forces. Current patterns measured at three harbors in which the circulation is largely controlled by currents flowing along the shores of the Great Lakes are presented. The current patterns are determined by the configuration of the breakwaters and the strength and direction of coastal flow. It appears certain that with adequate information on the nearshore-current and long-wave climates, the pattern of circulation can be forecast before construction of new or modification of existing coastal structures. This is of special importance on the Great Lakes not only to avoid adverse effects of the currents, but also to provide for adequate harbor flushing. The absence of significant astronomical tides in the lakes and the absence of other large-amplitude oscillations of water level makes interaction of the harbor with currents along the shore the most effective means of harbor flushing. The nearshore currents are driven chiefly by the shear stress of the wind, and both speed and direction of the currents are closely correlated with periods of high-energy input. The nearshore currents are certainly related to a wind-driven circulation of the entire lake basin. W74-04341

ANALYSIS OF THE PROPOSED LITTLE CHENA RIVER, EARTHFILLED NONRETEN-TION DAM, FAIRBANKS, ALASKA, Corps of Engineers, Anchorage, Alaska. For primary bibliographic entry see Field 8D. W74-04412

LABORATORY EXPERIMENTS TO DETER-MINE THE STRUCTURAL RESPONSE OF A VERTICAL PILE SUBJECTED TO WIND-GENERATED WATER WAVES,

Organization Massachusetts Univ., Amherst. School of Engineering. E. J. Chacko, and J. M. Colonell.

Available from the National Technical Informa-tion Service as AD-759703 \$3.00 in paper copy, \$1.45 in microfiche. Report No UM-73-4, 1973. 121 p, 61 fig, 5 tab, 36 ref, 2 append.

Descriptors: *Offshore platforms, *Oil industry, *Design criteria, *Ocean waves, Winds, Laborato-ry tests, Methodology, Time series analysis, Com-puter programs, Drilling equipment.

An investigation was undertaken to determine the structural response of a vertical cylindrical column to excitation by wind-generated water waves. Structural bending moments at two positions on the column, as well as water surface elevations near the column, were monitored continuously. The time series representations of wave heights, bending moments, and resultant wave forces on the columns (reduced from the two moment records), were analyzed with the following objectives: Evaluation of statistical assumptions which are ordinarily made for such data; and development of insight for formulation of the most realistic and/or mathematically tractable assumptions on which to base stochastic models of these processes. With reference to a Morison equation formulation of the problem, the experiments were characterized by inertia-dominated resultant wave forces on the column. Significant results include verification of a Gaussian probability model for observations of structural bending moment and resultant wave force on the column. Peak-to-peak values of bending moment and wave force were observed to follow a Rayleigh probability model within the limits imposed by most practical situa-tions. The transfer function which related resultant wave force to the incident windgenerated wave train was observed to be essentially constant over the dominant frequency band of the wave spectrum. A procedure is suggested for relating this type of laboratory experimenta-tion to prototype structural design. (Woodard-W74-04424

A LABORATORY INVESTIGATION OF FREE SURFACE FLOWS OVER WAVY BEDS, Iowa Univ., Iowa City. Inst. of Hydraulic

Research. A. F. H. Yuen, and J. F. Kennedy. Report No 121, December 1971. 43 p, 37 fig, 5 tab, 23 ref. USGS Contract No 14-08-0001-11420.

Descriptors: *Streamflow, *Sediment transport, *Channel morphology, Open channel flow, Sedimentary structures, *Hydraulic models, Flumes, Roughness(Hydraulic).

linearized, third-order analytical model developed to predict the amplitude ratio and phase shift between bed and surface waves of free-surface flows over sinusoidal beds was verified in a hydraulic model. Near resonance the surface configuration was complicated by the formation of hydraulic jump over each bed wave, and can only be analyzed within the framework of a nonlinear model. For selected experiments the spatial distributions of velocity, total head, bed pressure, and bed shear stress were also measured. The effects of bed curvature on the distributions of these quantities are discussed in the light of the findings of investigation of flow in wavy-walled pipes. The form of the velocity distribution varied widely along each wave, but conformed over much of the depth to the power law; an expression for the ex-ponent in the velocity distribution relation was derived from energy and continuity considera-tions. (Knapp-USGS) W74-04477

LAND DISPOSAL OF WASTE GASES: 1. FLOW ANALYSIS OF GAS INJECTION SYSTEMS, Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 5E.

W74-04479

LAND DISPOSAL OF WASTE GASES: II. GAS FLOW FROM BURIED PIPES, Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 5E.

HYDRAULIC PERFORMANCE OF BRIDGES--EXCAVATIONS AT BRIDGES, Geological Survey, Jackson, Miss. B. E. Colson, and K. V. Wilson. Mississippi State Highway Department Report MSHD-RD-73-015-EB, September 1973. 37 p, 18

fig, 5 tab, 3 ref. Descriptors: *Discharge(Water), *Scour, *Flood

plains, Stage-discharge relations, *Mississippi, Open channel flow, Flow around objects, Hydraudesign, *Excavation, Alluvial channels, Identifiers: Flow constrictions.

Excavation under bridges as a means of increasing their hydraulic capacity was studied by observing the stage and discharge through five bridge openings across a single flood plain. Three of the bridges had total downstream areas larger than the areas under the bridges before excavation, and increases in hydraulic capacity were indicated. A fourth bridge had a downstream subarea larger than the excavated areas near the abutments, and an increase in hydraulic capacity was also in-dicated. One bridge had a restricted area just downstream which acted as the control area, and no increase in hydraulic capacity was indicated. At one bridge, the maximum effective area is equal to the minimum area measured along the upstream or downstream perimeter of the excavation. After excavation, velocities were less uniform and were greater near the bottom than at the surface. (Knapp-USGS)
W74-04482 GALVESTON BAY HURRICANE SURGE STUDY: REPORT 2. EFFECTS OF PROPOSED BARRIERS ON TIDES, CURRENTS, SALINI-TIES, AND DYE DISPERSION FOR NORMAL TIDE CONDITIONS-APPENDIX B: CALIBRA-TION TESTS.

THON TES1S, Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab. R. A. Sager, and E. C. McNair, Jr. Technical Report H-69-12, Report 2, Append B, March 1973. 41 p, 10 photo, 18 plate.

Descriptors: "Hydraulic models, "Harbors, "Texas, "Hurricanes, Coastal engineering, Shore protection, Surges, Flood protection. Identifiers: "Galveston Bay.

A model test program was conducted to evaluate A moder test program was conducted to evaluate two proposed hurricane protection systems for Galveston Bay, Texas. Model structures allow the effects of two barrier plans on normal tide conditions to be evaluated in a distorted-scale model tions to be evaluated in a distorted-scale model (1:60 vertically and 1:600 horizontally). A model structure of a 400-ft-wide by 55 ft navigation opening was developed for each plan. Model structures of a total of 108 60-ft-wide tidal passages varying in depth from -10 to -40 ft msl were developed for the one plan and a total of 160 60-ft-wide tidal passages at depths of -6 and -12 ft msl were developed for another plan. (Knapp-USGS) W74-04573

WATER PROBLEMS OF THE TISZA RIVER IN HUNGARY AND COOPERATION AMONG TISZA BASIN COUNTRIES IN THE FIELD OF WATER MANAGEMENT (VODNYYE PROBLE-MY REKI TISY V VENGRII I SOTRUD-NICHESTVO STRAN BASSEYNA TISY V OBLASTI VODNOGO KHOZVAYST VA), For primary bibliographic entry see Field 4A. W74-04574

WAVE ACTION AND BREAKWATER DESIGN,

HAMLIN BEACH HARBOR, NEW YORK, Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab. C. W. Brasfeild.

C. W. Brasteid. Available from NTIS, Springfield, Va 22151 as AD-766 738, Price \$3.00 printed copy, \$1.45 microfiche. Technical Report H-73-13, August 1973. 34 p, 4 fig, 6 plate, 7 photo, 1 tab, 5 ref.

Descriptors: *Harbors, *Lake Ontario, York, *Breakwaters, *Hydraulic n Waves(Water), Coastal engineering. models.

A hydraulic model investigation was made of proposed harbor facilities at Hamlin Beach State Park, Lake Ontario, New York, to determine the Park, Lake Ontario, New York, to determine the most economical breakwater arrangement consistent with the provision of satisfactory entrance conditions and adequate protection to moored boats within the harbor. A wave machine and electrical wave height measuring and recording apparatus were utilized in model operation. The breakwater proposed for the west side of the entrance change could be reduced in least by 100 fe trance channel could be reduced in length by 100 ft without sacrificing the full protection desired for the entrance and inner harbor, and a reduction in length of another 100 ft would not seriously impair the desired protection. (Knapp-USGS) W74-04588

AN ANALYTICAL STUDY OF A COILED-PIPE

Cold Regions Research and Engineering Lab.,

A. Zehnder, Y. C. Yen, R. E. Perham, and W. F. Quinn

Special Report 195, November 1973, 33 p, 10 fig, 5 tab, 4 ref, append.

Descriptors: *Cryology, *Heat exchangers, *Heat transfer, *Waste disposal, Thermodynamics, Soil physics, Geothermal studies. ldentifiers: *Heat sinks.

An analytical study was conducted to determine the practicality of using a buried closed-loop, small-diameter coiled-pipe heat sink instead of a reservoir-type sink for emergency disposal of waste heat. The analysis was broadly based to per-mit application to a variety of soil types, mean ground temperatures, heat rejection rates, coolant water flow rates, pipe sizes, coil surface areas and coil spacings. The intent of the study was to present a problem-solving technique that would be useful to a design engineer faced with considering the use of a buried coiled pipe to dissipate a rather large amount of heat to the ground during a very limited period. The feasibility of such a system was found to be highly dependent upon the length of pipe required and the installation layout requirements for such a pipe network. (Knapp-USGS) W74-04589

STUDY OF BEACH WIDENING BY THE PERCHED BEACH CONCEPT, SANTA MONICA BAY, CALIFORNIA, Army Engineer Waterways Experiment Station, Vicksburg, Miss.

C. E. Catham, Jr., D. D. Davidson, and R. W.

Technical Report H-73-8, June 1973. 47 p, 10 fig, 17 tab, 24 photo, 14 plate, 20 ref, append.

Descriptors: *Beach erosion, *Coastal engineering, *California, *Hydraulic models, Shore protec-

Identifiers: *Santa Monica Bay(Calif).

Hydraulic model studies of beach erosion were conducted to aid in determining the technical conducted to aid in determining the technical feasibility and optimum design factors of the perched beach concept for widening the existing beach to provide right-of-way for a freeway along a portion of the Santa Monica Bay coastline. An undistorted, three-dimensional, fixed-bed model (scale 1:100) was used to determine the effect of the perched beach on rip currents. A distorted-scale (1:100 horizontal, 1:50 vertical), two-dimensional, movable-bed model was used to estimate the amount of sand which might be lost seaward over the toe structure due to normal and storm wave actions and to determine the optimum crown elevation of the submerged structure and the length of stone riprap apron required to reduce the seaward migration of sand to a minimum. An undistorted, two-dimensional model (scale 1:30) was used to determine the structural design of the proposed rubble-mound toe structure for various depths. Installation of the perched beach in the model had no adverse effect on rip currents and reduced rip current velocities about 20% for the configuration tested. Normal wave action (waves comiguration tested. Normal wave action (waves expected to occur a high percentage of the time) on the perched beach will cause no appreciable loss of beach fill. For the larger storm waves of any significant duration, a large net seaward loss of fill material can be expected. (Knapp-USGS) W74-04603

WAVE REFLECTION AND TRANSMISSION IN CHANNELS OF VARIABLE SECTION, Rutgers - The State Univ., New Brunswick, N. J. Dept. of Civil Engineering.
E. L. Bourodimos, and A. T. Ippen.
In: Proceedings of Eleventh Conference on Coastal Engineering, London, England, September 1968. American Society of Civil Engineers, Vol 1, Part 1, Chap 13, p 195-212, 1969. 10 fig, 11 ref.

Descriptors: *Waves(Water), *Channels, Shallow water.

Identifiers: *Wave steepness, Wave frequencies, *Wave reflection, Wave transmission

Reflection and transmission phenomena were investigated in a laboratory channel for transitions of linearly varying depth and/or width terminating in channels of reduced cross-section. Upstream wave characteristics were varied from deep to

shallow water waves by changing wave frequen-cies, amplitudes and channel depths over a wide spectrum of conditions. Experimental values were corrected to correspond to transmission in an endless channel. The reflection and transmission coefficients are given as functions of the pertinent dimensionless parameters such as group velocity ratio, channel depth ratio and wave steepness. Associated wave energies were also evaluated. (Sinha - OEIS) W74-04614

FIELD INVESTIGATION PRACTICES OF COASTAL STUDIES IN JAPAN,

Tokyo Univ. (Japan).
For primary bibliographic entry see Field 2L.
W74-04625

HYDRAULIC MODEL EXPERIMENT ON THE DUFFUSION DUE TO THE COASTAL CUR-

RENT, Kvoto Univ. (Japan). Disaster; Prevention Research Inst. For primary bibliographic entry see Field 5B.

USE OF A COMPUTATIONAL MODEL FOR TWO-DIMENSIONAL TIDAL FLOW, RAND Corp., Santa Monica, Calif. For primary isbiliographic entry see Field 2L. W74-04631

ZONE OF FLOW ESTABLISHMENT FOR ROUND BUOYANT JETS, Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 5B. W74-04657

ON THE STABILITY OF LAMINAR PLUMES: SOME NUMERICAL SOLUTIONS AND EX-PERIMENTS.

Cornell Univ., Ithaca, N.Y. Dept. of Mechanical For primary bibliographic entry see Field 5B. W74-04662

CONVECTIVE HEAT TRANSFER TO WATER CONTAINING BUBBLES: ENHANCEMENT NOT DEPENDENT ON THERMOCAPILLARI-

Oxford Univ. (England). Dept. of Engineering

D. B. R. Kenning, and Y. S. Kao. International Journal of Heat and Mass Transfer, Vol 15, No 9, p 1709-1716, 1972, 10 fig, 11 ref.

Descriptors: Fluid mechanics, *Entrainment, *Heat transfer, *Shear, *Capillary action, *Water temperature, Hydraulics, Flow, Liquids, Gases, Boundary layers, Surface tension, Reynolds number, Laboratory tests, Data collection, Heat flux, Surfactants, Vortices, Turbulence. Identifiers: "Thermocapillary flows.

Improvements in the heat-transfer coefficient of up to 50% occurred in the presence of small quantities of gas but the improvements were independent of heat flux over a range of 20-300 KW/square meter, indicating that thermocapillary flows made negligible contribution to the heat transfer process. Experiments were performed in which the surface tension of water in the ap-paratus remained within 0.2 degrees/cm of the value for pure water. An upstream injection of gas bubbles also increased the heat transfer coefficient by up to 50%. The increase depends on the gas flow rate and liquid phase Reynolds number but not on heat flux. A possible mechanism for the increase is secondary flow production by the interaction of bubbles with shear flow near the wall. (Jerome-Vanderbilt)

Field 8-ENGINEERING WORKS

Group 8B—Hydraulics

ANALYTICAL METHODS OF SOLUTION OF CONJUGATED PROBLEMS IN CONVECTIVE HEAT TRANSFER, Akademiya Nayuk BSSR, Minsk. Inst. of Heat

and Mass Transfer.

A. V. Luikov, V. A. Aleksashenko, and A. A. Aleksashenko

International Journal of Heat and Mass Transfer, Vol 14, No 8, p 1047-1056, 1971. 2 fig, 14 ref.

Descriptors: *Heat transfer, Fluids, *Model studies, "Thermodynamic behavior, 'Fluid mechanics, Hydraulics, Convection, Flow, Heat flow, Mathematical models, Thermal conductivi-ty, Dimensional analysis, Water temperature.

A method for solution of convective heat transfer problems is presented. The method takes into account the heat propagation in the solid in contact with a moving fluid. This method is referred to as the solution of conjugated problems. The heat transfer in laminar fluid flow in circular and planar tubes was treated with allowance for dissipation of mechanical energy. In addition, both steady and unsteady-state heat transfer problems for flow of a compressible fluid past a plate are considered. In all cases heat transfer in the fluid is discussed in relation to the heat transfer in the solid wall. On the basis of the analysis of the solution a new criterion is introduced which characterizes the effect of thermo-physical properties of the wall on heat transfer. Examples are used for illustration of the proposed method. (Jerome-Vanderbilt) W74-04667

FLOATING BREAKWATER PONTOON,

Reid, Middleton and Associates, Inc., Edmonds, Wash.; and Poly Sintering, Inc., Seattle, Wash. (Assignees). J. O. Olsen, and G. A. Visser.

U.S. Patent No. 3,777,689, 4 p, 6 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 917, No 2, p 514, December 11, 1973.

Descriptors: *Patents, *Shore protection, *Breakwaters, *Waves(Water), *Beach erosion, Pontoons, Hydraulic structures. Identifiers: *Wave action.

A rectangular floating structure having a grid pattern of walls and openings is formed from a nested array of uniquely shaped molded plastic pontoon modules. The modules are thin walled molded plastic hollow pontoons comprising an upper por-tion with a recess to allow for nesting the pontoons in position with other similar pontoons, a rectangular center pollution with protuberant end sections, and protuberant side sections extending outward from the central portion perpendicular to the end sections. When nested, the modules collectively form a grid pattern of rectangular openings extending into the upper portion of the wave to dissipate wave action. (Sinha-OEIS)

SELECTED BIBLIOGRAPHY ON BEACH FEATURES AND RELATED NEARSHORI TURES AND PROCESSES. NEARSHORE

Louisiana State Univ., Baton Rouge. Coastal Stu-For primary bibliographic entry see Field 2J. W74-04728

EFFECT OF ENTRANCE ON SEICHE MOTION IN OCEAN PORTS, Indian Inst. of Tech., Kharagpur. Dept. of Civil

Engineering. For primary bibliographic entry see Field 2L.

WAVES GENERATED BY HORIZONTAL MO-TION OF A WALL,

Army Coastal Engineering Research Center, Washington, D.C. M. M. Das, and R. L. Wiegel.

Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol 98, No WW1, Proceedings paper 8707, p 49-65, February 1972. 11 fig, 1 tab, 13 ref, 2

Descriptors: *Faults(Geologic),
*Earthquakes, *Waves(Water).
Identifiers: Surface waves, *Landslides. Identifiers: Surface waves, Wall motion, Linearized solutions, *Wall displacement, Solitary

The purpose is to determine the range of conditions for which the theoretical calculations of Noda based upon linear wave theory may be useful to the design engineer for the problem of surface waves generated by a vertical wall moving horizontally through water. Emphasis is on the problem of surface waves generated by a horizon-tal tectonic displacement of a portion of an underwater escarpment due to the strike fault movement of a fault oriented approximately normal to the escarpment. Also discussed is the problem of predicting water waves generated by landslides into water, which may occur either vertically, inclined at an angle, or even horizontally over a portion of their travel. Also described is the problem of waves generated in a reservoir by the horizontal motion of a dam during an earthquake. The regions of wave characteristics indicated by Noda for the box drop problem approximately describe the gross characteristics of the waves generated in the range of experiments performed for the wall-motion problem. The linearized solution appears to be in reasonable agreement with experimental results for fairly small values of wall displacement (but not for the smallest values) and velocity. The predictions of the maximum eleva-tion of the leading wave of the nonlinear waves by using the linearized solutions appear to be useful, provided the value is calculated for x* = 5. (Sinha W74-04760

PHENOMENA AFFECTING IMPROVEMENT OF THE LOWER COLUMBIA ESTUARY AND ENTRANCE,

Corps of Engineers, Portland, Oreg. Special Projects Investigation Section. For primary bibliographic entry see Field 2L. W74-04763

APPLICATION OF THE FINITE ELEMENT METHOD TO CONVECTION HEAT TRANSFER BETWEEN PARALLEL PLANES.

New South Wales Univ., Kensington (Australia).
A. O. Tay, and G. De Vahl Davis.
International Journal of Heat and Mass Transfer, Vol 14, No 8, p 1057-1069, 1971.

Descriptors: *Fluid mechanics, *Heat transfer, *Mass transfer, *Laminar flow, Hydraulics, Flow, Turbulence, Temperature, Thermal properties, Distribution, Hydrodynamics, Model Mathematical models, Convection. Identifiers: *Heat flux, Nusselt number.

Physical problems of the Poisson equation type have been solved numerically by the finite element method. Few attempts have been made to apply this method to problems involving transport phenomena. A problem of a fluid of constant properties flowing in steady, laminar motion between two infinite stationary parallel planes is con-sidered. A determination of the temperature distribution and the axial variation of the local Nus-selt number is made. The flow is hydrodynami-cally developed. The validity of the method is verified and some aspects of the method discussed. (Jerome-Vanderbilt) W74-04765

THE FALLACY OF BAER'S LAW OR CORIOLIS' EFFECT ON THE MEANDERING OF RIVERS, Karachi Univ. (Pakistan).

M. S. Ouraishy. Sind University Research Journal (Science Series) Vol 6, p 59-68, 1972. 3 fig, 8 ref.

Descriptors: *Meanders, *Coriolis force, Hydraulics, Mathematical studies, Hydrodynamics, *Rivers. Identifiers: *Baer's law.

The problem of the effect of the earth's rotation on a water body at any latitude was analyzed mathematically. The deviating force, known in literature as Baer's Law or Coriolis' Effect, is too insignificant to give rise to river meandering or the antecedent and subsequent phenomena, which in-evitably must be looked upon as problems falling in the domain of hydromechanics. (Knapp-USGS) W74-04799

THE CALCULATION OF CRITICAL DISCHARGE VELOCITY OF STREAMS IN UNIFORM FLOW AND THE TRANSPORTED SEDIMENT SIZE, For primary bibliographic entry see Field 2J. W74-04800

SUSPENDED AND BEDLOAD SEDIMENT TRANSPORT IN THE SNAKE AND CLEAR-WATER RIVERS IN THE VICINITY OF LEWISTON, IDAHO, Geological Survey, Boise, Idaho. For primary bibliographic entry see Field 2J. W74-04846

8C. Hydraulic Machinery

BREEDER REACTORS: POWER FOR THE FU-TURE, A. L. Hammond.

Science, Vol 174, No 4011, p 807-809, November 19, 1971. 1 fig.

Descriptors: *Breeder reactors, *Nuclear reac-*Fuels, Electric powerplants, Nuclear powerplants, Nuclear energy, Nuclear engineering, Thermal powerplants, Cooling water, Uranium radioisotopes.

Identifiers: *Sodium cooling, Plutonium, Thori-

um, Uranium.

Breeder reactors are so called because they produce more fuel than they consume. The prototypes are already in operation in France, Britain, and U.S.S.R. The attractiveness of breeder reacmore naturally abundant form of juranium (238 U), which results in substantially lower fuel costs. The primary effort both in the United States and elsewhere is concentrated in a fast breeder design that will use liquid sodium as a coolant and heat transfer medium and a plutonium oxide as a fuel. AEC is also investigating a thermal breeder reactor that would be moderated with water. (Oleszkiewicz-Vanderbilt)

ECONOMIC POWER FROM GEOTHERMAL HEAT, For primary bibliographic entry see Field 4B. W74-04766

8D. Soil Mechanics

MECHANICAL PROPERTIES OF FROZEN GROUND UNDER HIGH PRESSURE, Cold Regions Research and Engineering Lab., For primary bibliographic entry see Field 2C. W74-04375

EVALUATION OF IN SITU CREEP PROPER-TIES OF FROZEN SOILS WITH THE PRES-SUREMETER, Ecole Polytechnique, Montreal (Quebec).

For primary bibliographic entry see Field 2C. W74-04377

SHOCK-WAVE STUDIES OF ICE AND TWO FROZEN SOILS, California Univ., Livermore. For primary bibliographic entry see Field 2C.

THAW CONSOLIDATION OF ALASKAN SILTS AND GRANULAR SOILS, Woodward-Lundgren and Associates, Oakland,

For primary bibliographic entry see Field 2C. W74-04379

MECHANICAL PROPERTIES OF ROCKS AT LOW TEMPERATURES, Cold Regions Research and Engineering Lab., Hanover, N.H.

For primary bibliographic entry see Field 2C. W74-04380

SOUND AND SHOCK TRANSMISSION IN FROZEN SOILS,

Cold Regions Research and Engineering Lab., Hanover, N.H. For primary bibliographic entry see Field 2C.

PRACTICAL EXTENSIONS TO A THEORY OF CONSOLIDATION FOR THAWING SOILS, Alberta Univ., Edmonton.

For primary bibliographic entry see Field 2C. W74-04384

TRIAXIAL AND CREEP TESTS ON FROZEN OTTAWA SAND,

Cold Regions Research and Engineering Lab., Hanover, N.H.

For primary bibliographic entry see Field 2C. W74-04386

VISCOELASTIC PROPERTIES OF FROZEN SOIL UNDER VIBRATORY LOADS,

Cold Regions Research and Engineering Lab. Hanover, N.H. H. W. Stevens.

In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973, p 400-409, 1973. 11 fig, 1 tab. 11 ref.

*Rheology, Descriptors: *Soil strength, *Rheology, *Permafrost, *Viscosity, *Frozen soils, Porosity, Descriptors: Ice, Plasticity.
Identifiers: Viscoelastic properties of soils.

The viscoelastic properties of frozen soil may be determined by subjecting a cylinder of the soil to steady-state vibration and measuring the resonant frequency and amplitude ratio. Using the mass density and the length of the cylinder and applying viscoelastic theory and boundary cond tions, the desired parameters can be evaluated. The modulus of saturated frozen soils decreases with increasing void ratio. The maximum modulus for a given saturated soil depends on its minimum void ratio and the soil type. The degree of ice saturation has maximum effect on the modulus, as maximum modulus occurs with 100% saturation and minimum modulus occurs when no ice is contained in the voids or a nonfrozen dry state. The modulus of frozen soil is about two orders of magnitude greater than the modulus of the same soil in intude greater than the modules of the nonfrozen state. The damping coefficient is approximately equal to or slightly higher for frozen soil than for nonfrozen soil. The modulus of

frozen soil decreases with increasing temperature. nozen son decreases with increasing temperature, but the rate is small until temperature is higher than about -4 deg C. From -4 to 0 deg C, the rate of decrease of modulus sharply increases. (See also W74-03486) (Knapp-USGS)

SHEAR STRENGTH AT A THAW INTERFACE, Alberta Univ., Edmonton. For primary bibliographic entry see Field 2C. W74-04390

ENGINEERING DESIGN AND CONSTRUCTION IN PERMAFROST REGIONS: A REVIEW,
Cold Regions Research and Engineering Lab., Hanover, N.H.

Hanover, N.H.
K. A. Linell, and G. H. Johnston.
In: International Conference on Permafrost 2nd,
Yakutsk, USSR 1973. p 553-575, 1973. 190 ref.

Descriptors: *Permafrost, *Construction, *Reviews, *Design, Land use, Environment, *Cold weather construction, Cold regions, Arctic, Dam construction, Engineering, Road construction, Civil engineering, Excavation, Subsidence, Frost heaving, Soil mechanics, *Bibliographies.

In North America, development of the permafrost regions is advancing at a rapidly accelerating rate. This creates increasingly intense pressure to for-mulate engineering design and construction principles. Proper selection and investigation of a site or route for construction is important. Full-scale field tests are necessary. Design to insure preservation of the permafrost is the most commonly used approach for permanent construction. Spread footings, continuous footings, raft or mat foundations, or post and pad construction have been successfully used on thaw-unstable as well as thaw-stable permafrost. Thermal control usually con-sists of either a simple ventilation space between sists of either a simple ventilation space between the structure and the ground surface or of duct systems. Construction of anchorages is difficult because of creep, thermal instability, and frost heave. Foundations for bridges or for port con-struction are difficult problems because the permafrost conditions are altered near and under the water. Significant laboratory and field work has been done over the past decade to investigate methods of penetration, excavation, and handling of frozen ground and ice, including frozen ore, and of underground construction. In very cold per-mafrost areas it is feasible to construct dams with permanent reservoir water storage, even with relatively pervious embankment materials, because seepage is sealed off by freezing of the embankment. It is within the technological state of the art to develop and make available the petroleum resources of land areas of the Arctic with acceptably low environmental impact. (See also W74-04346) (Knapp-USGS) W74-04404

SOME PASSIVE METHODS OF CON-TROLLING GEOCRYOLOGICAL CONDITIONS SOME IN ROADWAY CONSTRUCTION, Cold Regions Research and Engineering Lab., Hanover, N.H. For primary bibliographic entry see Field 2C. W74-04406

SETTLEMENT ASSOCIATED WITH THE THAWING OF PERMAFROST. Cold Regions Research and Engineering Lab., Hanover, N.H. For primary bibliographic entry see Field 2C. W74-04408

REGIME IN AN ARCTIC THERMAL EARTHFILL DAM, Cold Regions Research and Engineering Lab., Hanover, N.H. C. W. Fulwider.

In: International Conference on Permafrost 2nd, Yakutsk, USSR 1973. p 622-628, 1973. 7 fig, 1 tab,

Descriptors: *Dams, *Dam design, *Permafrost, *Arctic, *Earth Dams, Dam construction, Freezing, Water storage, Water temperature. Identifiers: *Greenland.

The Crescent Lake Dam is an earthfill embankment constructed near Thule Air Base, Grenland, to impound a dependable water supply for the base. It is one of very few such structures in the Arctic or Subarctic. The design of the dam was based on the premise that the soil in the central part of the embankment would remain frozen throughout the year, creating an impervious core section, and that the water surface elevation would remain below the top of the frozen portion of the dam. Two winters were required to establish a stable thermal regime in the original 3.6-m dam and about the same after increasing embankment height by about 2.4 m, although in both instances thawing beneath the crest was limited to about 1.8 m after only one winter. The limiting height for complete freezeback in one winter is in excess of 3.6 m, and perhaps as much as 6 m. For an earthfill 3.6 m, and pernaps as much as 6 m. Por an eartmudam of greater height, it is probable that construction in stages, over several years, would be necessary to ensure dependable natural freezeback of the core section if it is desired to achieve this freezeback before water is impounded. (See also W74-04346) (Knapp-USGS) W74-04410

ANALYSIS OF THE PROPOSED LITTLE CHENA RIVER, EARTHFILLED NONRETEN-TION DAM, FAIRBANKS, ALASKA,

Corps of Engineers, Anchorage, Alaska. W. George.

In: International Conference on Permafrost 2nd, Yakutsk, USSR 1973. p 638-648, 1973. 9 fig, 2 tab,

Descriptors: *Dams, *Dam design, *Permafrost, *Alaska, Dam construction, Thawing, Sub-sidence, Arctic. Flood control. Water storage. Water temperature, Earth dams.

A dam near Fairbanks, Alaska, will be located in an area in which the permafrost temperature is more marginal than that existing in the areas where such structures have been previously built with permafrost preservation in mind. The same requiremens exist, however, to protect the permafrost and, in fact, these are even more of a concern. Because of its use for temporary storage, a moderation and, in fact, control of the heat absorption into the dam from these impounded waters will result. This controlled and limited heat input is an important factor in even considering the design and construction proposed. Conservative calculations show that there exists more than a margin of safety from the heat input from such temporary and infrequent impoundments when balanced against heat loss. The more frequent floods will normally be of the spring snowmelt type with water temperature quite cold and the du-ration of the impoundment quite short. The less frequent flood, where water temperatures may be somewhat higher, will not be a problem. (See also W74-04346) (Knapp-USGS) W74-04412

SOME EFFECTS OF SURFACE DISTURBANCE ON THE PERMAFROST ACTIVE LAYER AT INUVIK, N.W.T., CANADA, Geological Survey of Canada, Ottawa (Ontario). For primary bibliographic entry see Field 4C. W74-04413

CORPS OF ENGINEERS TECHNOLOGY RE-LATED TO DESIGN OF PAVEMENTS IN AREAS OF PERMAFROST, Corps of Engineers, Washington, D.C. For primary bibliographic entry see Field 4C.

Field 8—ENGINEERING WORKS

Group 8D-Soil Mechanics

W74-04414

PERMAFROST PROTECTION FOR PIPELINES, Esso Production Research Co., Houston, Tex. For primary bibliographic entry see Field 2C.

ENGINEERING PERMAFROST-RELATED GEOLOGY PROBLEMS POSED BY TRANS-ALASKA PIPELINE,

Geological Survey, Menlo Park, Calif. R. Kachadoorian, and O. J. Ferrians, Jr.
In: International Conference on Permafrost 2nd, Yakutsk, USSR 1973. p 684-687, 1973. 1 fig, 11 ref.

Descriptors: *Permafrost, *Pipelines, *Alaska, *Arctic, *Oil fields, Frozen ground, Frozen soils, Subsidence, Frost heaving, Thawing, Freezing.

The design, construction, and maintenance of the proposed trans-Alaska pipeline system in the permafrost region of Alaska poses special engineering problems. The severity of problems resulting from soil instability, differential settlement, and erosion of thawed soil depends on the type and ice content of the soil and the slope and drainage conditions. Soil instability, differential settlement, erosion, and disrupted surface and subsurface drainage can result in loss of support and rupture of the pipe. Consequently, the effects of thawing permafrost and of erosion must first be determined and then minimized or controlled by proper design, proper arctic and subarctic construction procedures, and an adequate monitoring system. Some potential effects are so serious that contingency plans must be devised. These actions are necessary in order to maintain the mechanical integrity of the pipeline and to avoid degradation of the adjacent terrain. (See also W74-04346) (Knapp-USGS) W74-04416

STABILITY OF AN UNDERGROUND ROOM IN FROZEN GRAVEL.

Bureau of Mines, Spokane, Wash. For primary bibliographic entry see Field 2C. W74-04418

PERFORMANCE OF A WARM-OIL PIPELINE BURIED IN PERMAFROST, Mackenzie Valley Pipeline Research Ltd., Calgary

(Alberta).

G. H. Watson, R. K. Rowley, and W. A. Slusarchuk.

In: International Conference on Permafrost 2nd, Yakutsk, USSR, 1973. p 759-766, 1973. 7 fig, 3 tab,

Descriptors: *Permafrost, *Pipelines, *Oil fields, *Thawing, *Subsidence, Frost heaving, Freezing, Arctic, *Canada.

To study the behavior of permafrost as a foundation material for a warm-oil pipeline, a 27-m test section of 0.61-m-diameter pipe was installed near Inuvik, N.W.T. The surrounding foundation material (ice-rich silty clay) was thawed by circu-lating oil at 71 deg C. During thawing of the foundation, excess pore pressures were recorded. In the upper layers, two of three piezometers indicated that the pore pressures dissipated rapidly. At greater depths, pore pressure rose to a maximum value and remained nearly constant during the testing period. Although the values of excess pore pressures are small, hydraulic gradient was developed at depth. Settlement measurements show variability over short distances. However, the amount of settlement was predicted within practical accuracy by using average values obtained from laboratory thaw-settlement tests. For the test section, oil was circulated at 71 deg C from the test section, of was crudated at 7 deg C roll the start of the test, whereas for the pipeline a buil-dup from 38 to 60 deg C in 5 years is proposed. Under full-scale operation, the slower heat buil-dup would result in lower pore pressures and slower settlement rates. (See also W74-04346) (Knapp-USGS) W74-04423

QUICKCLAYS AS PRODUCTS OF GLACIAL ACTION: A NEW APPROACH TO THEIR NA-TURE, GEOLOGY, DISTRIBUTION AND GEOTECHNICAL PROPERTIES, Leeds Univ. (England). Dept. of Civil Engineering. For primary bibliographic entry see Field 2G. W74-04590

8F. Concrete

LABORATORY STUDY OF SELF-SEALING LIMESTONE PLUGS FOR MINE OPENINGS, NUS Corp., Pittsburgh, Pa. Cyrus Wm. Rice Div. For primary bibliographic entry see Field 5G. W74-04559

8G. Materials

THE USE OF POLYURETHANE FOAM PLASTICS IN THE CONSTRUCTION OF EX-PEDIENT ROADS ON PERMAFROST IN CEN-TRAL ALASKA.

Cold Regions Research and Engineering Lab., Hanover, N.H.

N. Smith, R. Berg, and L. Muller.

In: International Conference on Permafrost, 2nd, Yakutsk, USSR, 1973. p 736-745, 1973. 10 fig, 4 tab. 1 ref

Descriptors: *Permafrost, *Road construction, *Arctic, *Insulation, Thermal insulation, Frost heaving, Thawing, *Plastics, *Alaska.
Identifiers: Polyurethane foam.

In the cold regions of the world, seasonally and permanently frozen soils present severe road construction and maintenance problems during winter and the thawing period. The use of as much as 1.0-3.0 m of granular materials to minimize or prevent deleterious freezing and thawing actions is com-mon practice. In general, for expedient roads designed for short lives, such as those required for lumbering, mining and oil explorations, and military operations, this method is too time consuming; also, many areas lack sufficient quantities of granular materials for this practice. Road test sec-tions incorporating foamed in-place polyurethane insulation of two densities were tested over a subgrade containing seasonally and permanently frozen high-moisture-content silt. On permafrost terrain similar to central Alaska, 10 cm of foam insulation is sufficient thickness to withstand 1,000 passes of a loaded dump truck having a maximum single wheel load of 2,415 kg. Additional use as an access road for lumbering, mining, and oil explora-tions, and military operations with wheel loads up to 5,000 kg could be handled for a minimum of one thaw season. Wood chips as a leveling course provided some insulation advantage over the gravel leveling course of approximately equal thickness. (See also W74-04346) (Knapp-USGS) W74-04421

8I. Fisheries Engineering

FISHERY SURVEY CARRIED OUT AT LAKE BORULLUS, A. R. E., IN THE SPRING OF 1971, (IN CZECH)

Ceskoslovenska Akademie Ved, Brno. Ustav pro Vyzkum Obratlovcu. For primary bibliographic entry see Field 2H. W74-04643

FEEDING OF JUVENILE CARP CYPRINUS CARPIO L. IN THE ARAKUM BODIES OF WATER (DELTA OF THE TEREK RIVER) AT

EARLY DEVELOPMENTAL STAGES, (IN RUS-

SIAN), Kaspiiskii Nauchno-Issledovatelskii Institut Rybnogo Khozyaistva, Makhachkala (USSR). For primary bibliographic entry see Field 2L. W74-04649

MORPHOLOGY AND LIFE STYLE OF THE TURKESTAN GUDGEON GOBIO GOBIO LEPIDOLAEMUS KESSLER IN WATERS OF THE SUKHAN-DARYA BASIN, (IN RUSSIAN),

THE SUKHAN-DARTA BASH, (III)
A. A. Amonov.
Vopr Ikhtiol. p 657-664. 1972.
Identifiers: Barbel, Carp, Gobio-Gobio-Gobio-Gobio-Gobio-Lepidolaemus, Gobio-Gobio-Nikolskii, *Gudgeon, Morphology, Turkestan, *USSR(Sukhan-Darya basin), *Fish reproduction, Fish behavior, *Fish diets.

G. gobio lepidolaemus was compared morphologically to G. gobio gobio and G. gobio nikolskii. Populations of G. gobio lepidolaemus from 4 different bodies of water differed sharply by up to 8 morphological features out of 22 studied. The fishes reached sexual maturity at 45-53 mm. They spawned from May-June and had a high reproductive capacity. Conditioning varied in different bodies of water. They compared with wild carp. bodies of water. They competed with wild carp and barbel for food. Favorable feeding conditions and the almost complete absence of predators sug-gested that their numbers will increase.--Copyright 1973, Biological Abstracts, Inc. W74-04650

PARASITE FAUNA OF CTENOPHARYN-GODON IDELLA FROM POND- AND SPAWNING-NURSERY FISHERIES IN THE VOLGA DELTA, (IN RUSSIAN), Kaspiiskii Nauchno-Issledovatelskii Institut Ryb-

nogo Khozyaistva, Astrakhan (USSR). T. V. Astakhova, and G. A. Stepanova. Parazitologiya. Vol 6, No 4, p 364-368. 1972,

(English summary).

Identifiers: Amurotrema-Dombrowskajae, Balanidium-Ctenopharyngodonis, *Ctenopharyngodon-Idella, Dactylogyrus-Lamellatus, Deltas, Fauna, *Fisheries, Nursery, *Parasite, Ponds, Sineragasi-lus-Major, Spawning, *USSR(Volga delta).

The parasite fauna of first yr brood, second yr The parasite fauna of first yr brood, second yr brood, and fifth yr brood yearlings of C. idella from pond- and spawning-nursery fisheries was studied in connection with the acclimatization of phytophagous fishes of the Chinese complex in the Volga Delta. Parasites (18 spp.) were found in fishes. Four new species were brought into this region with C. idella, i.e., Balantidium ctenopharyngodonis, Dactylogyrus lamellatus, Amurotrema dombrowskaine and Sinerogasilus maior. Conv. dombrowskajae, and Sinerogasilus major.--Copy-right 1973, Biological Abstracts, Inc. W74-04702

CONDUIT STRUCTURE FOR MIGRATING FISH.

J. E. Raistakka.

U.S. Patent No. 3,772,891, 3 p, 7 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 916, No 3, p 857-858, November 20, 1973.

Descriptors: *Patents, *Fish migration, *Fish passages, *Conveyance structures, Engineering structures, Dams, *Fish barriers, Migrations,

Migrating fish may circumvent a dam by use of a conduit enabling their passage upstream and downstream. The conduit terminates in segments projecting in a submerged manner outward into the river; the segments are flexible to a degree to permit vertical positioning of the conduit ends for optimum fish ingress and egress. It is closed from the atmosphere to prevent the addition of nitrogen to the water passing through the conduit. A con-stant gradient and constant flow facilitate fish passage. Spaced along the conduit are series of

SCIENTIFIC AND TECHNICAL INFORMATION—Field 10

Preparation Of Reviews—Group 10F

flow disrupting projections which cause the water now distiplined by the conduit water currents providing resting areas for the fish. Fish attracting substances are fed into the conduit water to help overcome the natural tendency of fish to shy away from the entry of the conduit. (Sinha-OEIS)

PINK AND CHUM SALMON CULTURE, Oregon State Univ., Corvallis.

W. J. McNeil. W. J. McNett. Available from NTIS, Springfield, Va. 22151 COM-72-11056 for \$3.00 printed copy; \$1.45 microfiche. Completion Report to NOAA, Na-tional Marine Fisheries Service, July 1970. 4 p, 3

Discriptors: *Fish hatcheries, *Oregon, Fish handling facilities, *Pink salmon, *Chum salmon, Fish management. Identifiers: *Netarts Bay(Oreg).

A prototype pink and chum salmon hatchery is being tested at Netarts Bay, Oregon, by Oregon State University working in cooperation with the National Science Foundation's Sea Grant Program, the Fish Commission of Oregon, and the U.S. Bureau of Commercial Fisheries. The hatchery is designed to simulate conditions in a good quality natural spawning bed to produce robust fry which retain natural behavioral traits. In theory, the hatchery offers the promise of using theory, the hatchery offers the promise of using very small coastal streams as a water source, streams which provide insufficient water for sp-waning channels. The prototype hatchery consists of wooden hatchery tanks with water upwelling of wooden hatchery tanks with water upwelling across a bed of crushed rock at velocities ranging from 20 to 40 inches per hour. Fertilized eggs are placed on screened trays which overlie the crushed rock. Lids exclude light. Excess water overflows through drains to provide fry a pathway from the hatchery tanks. The fry leave voluntarily and swim about 150 feet through raceways to reach Netarts Bay. (Knapp-USGS) W74-04797

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

TENTH YEAR ANNUAL REPORT, CENTER FOR RESEARCH IN WATER RESOURCES, UNIVERSITY OF TEXAS AT AUSTIN. Texas Univ., Austin. Center for Research in Water

(CRWR News, Vol 9, No 4), September 1973. 27 p.

Descriptors: *Universities, *Texas, Resources Research Act, Colleges, Grants, Contracts, Research and development, Laboratories, Research facilities, *Education, *Training, Optimum development plans, Systems analysis, Reonal analysis. Identifiers: University of Texas.

The Center for Research in Water Resources (CRWR) was established in the spring of 1963 to facilitate interdisciplinary programs of water resources research in engineering, in biological, physical and social sciences, and in law. CRWR seeks to fulfill these goals: to serve higher educa-tion, and other institutions, in the process by which skilled people will become available to serve using agencies; to provide a regional center of expertise and a repository of knowledge for use in research, education, practical projects, planning, and design; to serve public interests in the conservation, development, and use of water resources, particularly assisting planning and regulatory bodies at local, state, regional, and federal levels; and to make available to business and in-dustry the services of advanced research. The main thrust of research for this fiscal year (1974) is analyzing and evaluating optimum management techniques of regional water systems, and environmental system analysis. (Knapp-USGS)

9D. Grants, Contracts, and Research Act Allotments

FEDERAL WATER RESOURCES RESEARCH PROGRAM FOR 1971.
National Science Foundation, Washington, D.C.

Science and Technology Policy Office. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 Price \$1.70. Publication NSF 73-400, 1973. 134 p, 3 tab, 2 append.

Descriptors: *Water resources research act, *Research and development, Federal government, Conferences.

*Committee on Water Resources Identifiers: Research.

This report of the Committee on Water Resources Research of the Federal Council for Science and Technology is the Committee's periodic statement on the state of water resources research in the Federal Government. Each agency of government with a water resources research program is re-ported on individually. This report also presents the usual summaries of the total water resources research effort in the Government under the 10 categories developed previously by this Committee. (Knapp-USGS) W74-04848

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication **And Distribution**

THERMAL CONDITIONS IN PERMAFROST--A REVIEW OF NORTH AMERICAN LITERA-

National Research Council of Canada, Ottawa (Ontario) For primary bibliographic entry see Field 2C. W74-04347

DISTRIBUTION OF PERMAFROST IN NORTH AMERICA AND ITS RELATIONSHIP TO THE ENVIRONMENT: A REVIEW, 1963-1973, National Research Council of Canada, Ottawa

(Ontario). For primary bibliographic entry see Field 2C. W74-04353

PHYSICS, CHEMISTRY, AND MECHANICS OF

FROZEN GROUND: A REVIEW, Cold Regions Research and Engineering Lab., Hanover, N.H. or primary bibliographic entry see Field 2C. W74-04373

MAPPING AND PREDICTING PERMAFROST IN NORTH AMERICA: A REVIEW, 1963-1973, Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 2C. W74-04398

ENGINEERING DESIGN AND CONSTRUCTION IN PERMAFROST REGIONS: A REVIEW, Cold Regions Research and Engineering Lab., Hanover, N.H.

For primary bibliographic entry see Field 8D. W74-04404

WORLD DESERTIFICATION: CAUSE AND EFFECT. A LITERATURE REVIEW AND ANNOTATED BIBLIOGRAPHY, Arizona Univ., Tucson. Office of Arid Lands Stu-For primary bibliographic entry see Field 3B. W74-04461

COMMUNITY WATER SUPPLY.
Agency for International Development, Washington, D.C. Office of the War on Hunger.
For primary bibliographic entry see Field 4B.

HOUSING AND PLANNING REFERENCES. Department of Housing and Urban Development, Washington, D.C. For primary bibliographic entry see Field 3D. W74-04511

PLANT RESPONSES TO WATER STRESS, California Univ., Davis. Lab. of Plant-Water Rela-For primary bibliographic entry see Field 2I. W74-04539

1972 REVIEW OF THE LITERATURE ON PULP AND PAPER EFFLUENT MANAGEMENT. National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5D. W74-04540

THE WATER BALANCE IN ARCTIC AND SUB-ARCTIC REGIONS--ANNOTATED BIBLIOG-RAPHY AND PRELIMINARY ASSESSMENT, Cold Regions Research and Engineering Lab., Hanover, N.H. For primary bibliographic entry see Field 2C. W74-04601

FIELD INVESTIGATION PRACTICES OF COASTAL STUDIES IN JAPAN, Tokyo Univ. (Japan). For primary bibliographic entry see Field 2L. W74-04625

SELECTED BIBLIOGRAPHY ON BEACH FEATURES AND RELATED NEARSHORE PROCESSES. Louisiana State Univ., Baton Rouge. Coastal Studies Inst.

For primary bibliographic entry see Field 2J. W74-04728

AN ANNOTATED BIBLIOGRAPHY OF FLUSH-ING AND DISPERSION IN TIDAL WATERS, Navy Hydrographic Office, Washington, D. C. For primary bibliographic entry see Field 2L. W74-04731

10F. Preparation Of Reviews

THERMAL CONDITIONS IN PERMAFROST-A REVIEW OF NORTH AMERICAN LITERA-TURE, National Research Council of Canada, Ottawa (Ontario). For primary bibliographic entry see Field 2C. W74-04347

DISTRIBUTION OF PERMAFROST IN NORTH AMERICA AND ITS RELATIONSHIP TO THE ENVIRONMENT: A REVIEW, 1963-1973, National Research Council of Canada, Ottawa (Ontario). For primary bibliographic entry see Field 2C. W74-04353

Field 10—SCIENTIFIC AND TECHNICAL INFORMATION

Group 10F-Preparation Of Reviews

ORIGIN, COMPOSITION, AND STRUCTURE OF PERENNIALLY FROZEN GROUND AND GROUND ICE: A REVIEW, British Columbia Univ., Vancouver. For primary bibliographic entry see Field 2C. W74-04366

PHYSICS, CHEMISTRY, AND MECHANICS OF FROZEN GROUND: A REVIEW, Cold Regions Research and Engineering Lab., Hanover, N.H. For primary bibliographic entry see Field 2C. W74-04373

GROUNDWATER INVESTIGATIONS IN PER-MAFROST REGIONS OF NORTH AMERICA: A REVIEW, Geological Survey, Boston, Mass. For primary bibliographic entry see Field 02F. W74-04391

MAPPING AND PREDICTING PERMAFROST IN NORTH AMERICA: A REVIEW, 1963-1973, Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 02C. W74-04398

ENGINEERING DESIGN AND CONSTRUCTION IN PERMAFROST REGIONS: A REVIEW, Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 08D.
W74-04404

SOUTHWESTERN GROUNDWATER LAW: A TEXTUAL AND BIBLIOGRAPHIC INTERPRETATION, Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 04B. W74-04460

WORLD DESERTIFICATION: CAUSE AND EFFECT. A LITERATURE REVIEW AND ANNOTATED BIBLIOGRAPHY, Arizona Univ., Tucson. Office of Arid Lands Studies.
For primary bibliographic entry see Field 03B. W74-04461

PLANT RESPONSES TO WATER STRESS, California Univ., Davis. Lab. of Plant-Water Relations. For primary bibliographic entry see Field 02I. W74-04539

1972 REVIEW OF THE LITERATURE ON PULP AND PAPER EFFLUENT MANAGEMENT, National Council of the Paper Industry for Air and Stream Improvement, Inc., New York. For primary bibliographic entry see Field 05D. W74-04540

SUBJECT INDEX

ABSORPTION Annual Consumption of Cesium-137 and	Indirect Mapping of the Snowcover for Per- mafrost Prediction at Schefferville, Quebec,	ALASKA Hydrology of the Central Arctic River Basins
Cobalt-60 Labeled Pine Seeds by Small Mam- mals in an Oak-Hickory Forest,	W74-04356 2C	of Alaska, W74-04304 2A
W74-04450 5B	Postglacial Permafrost Features in Eastern Canada.	Ecological Effects of River Flooding and
Distribution and Uptake of Artificially In-	W74-04358 2C	Forest Fires on Permafrost in the Taiga of
troduced Radium-226 in a Small Lake, W74-04785 5B	Water Resources Applications,	Alaska, W74-04352 2C
	W74-04584 7B	The Occurrence and Characteristics of
Production of Epilithiphyton in Two Lakes of the Experimental Lakes Area, Northwestern Ontario,	AEROBIC BACTERIA Identification of Bacteria by Computer: Theory	Nearshore Permafrost, Northern Alaska, W74-04359 2C
W74-04787 5C	and Programming, W74-04791 5A	Geochemistry of Permafrost and Quaternary
ACID MINE WATER	W/4-04/91	Stratigraphy,
Laboratory Study of Self-Sealing Limestone	AFRICA (KAROO)	W74-04364 2C
Plugs for Mine Openings, W74-04559 5G	Drought and Supplementary Feeding of Sheep in the Karoo, W74-04834 3F	Stratigraphy and Diagenesis of Perennially Frozen Sediments in the Barrow, Alaska, Re-
ACTIVATED CARBON		gion, W74-04365 2C
Processes for Reducing the Organic-Carbon	AFRICA (SENEGAL) Rainfed Rice in Southern Senegal: Evaluation	
Content of Water Contaminated with Organic	of Three Years' Experimentation (1966-1969),	Effects of Permafrost on Stream Flow Charac- teristics in the Discontinuous Permafrost Zone
Compounds by Continuous Countercurrent Multistage Treatment with Activated Carbon,	(In French),	of Central Alaska,
W74-04704 5D	W74-04829 3F	W74-04392 2C
ACTIVATED SLUDGE	AFRICA (TANZANIA)	Recharge of a Central Alaska Lake by Subper-
200 MGD Activated Sludge Plant Removes Phosphorus by Pickle Liquor,	Aedes aegypti and Aedes simpsoni Breeding in Coral Rock Holes on the Coast of Tanzania,	mafrost Groundwater, W74-04394 2F
W74-04554 5D	W74-04697 2I	Risk of Uncontrolled Flow from Wells Through
Method of Treating Sewage Using High	AGGREGATES	Permafrost,
Polymer Ratio Flocculation Agent Biologically Produced in Situ,	Laboratory Study of Self-Sealing Limestone Plugs for Mine Openings, W74-04559 5G	W74-04395 2F A Groundwater Supply for an Oil Camp Near
W74-04717 5D	W 14-04339	Prudhoe Bay, Arctic Alaska,
ADENOSINE TRIPHOSPHATE	AGRICULTURAL WATERSHEDS	W74-04396 2F
Measurement of Adenosine Triphosphate (ATP) in Two Precambrian Shield Lakes of	Soluble Phosphate Output of an Agricultural Watershed in Pennsylvania, W74-04804 5B	The Nature of the Seawater-Freshwater Inter- face During Breakup in the Colville River
Northwestern Ontario, W74-04782 5B	AGRICULTURE	Delta, Alaska, W74-04397 20
W14-04702	Allocation of Scarce Resources to Agricultural	
AEDES-AEGYPTI Aedes aegypti and Aedes simpsoni Breeding in	Research: Review of Methodology, W74-04566 3F	Some Passive Methods of Controlling Geocryological Conditions in Roadway Con-
Coral Rock Holes on the Coast of Tanzania,		struction, W74-04406 20
W74-04697 2I	AIR POLLUTION Trans-Pacific Fallout and Protective Counter-	W74-04406 20
AEDES-SIMPSONI	measures,	Control of Permafrost Degradation Beneath
Aedes aegypti and Aedes simpsoni Breeding in Coral Rock Holes on the Coast of Tanzania,	W74-04454 5B	Roadway by Subgrade Insulation, W74-04409 40
W74-04697 2I	Environmental Radioactivity,	Analysis of the Proposed Little Chena River
A FOX THE CANIDO	W74-04456 5B	Earthfilled Nonretention Dam, Fairbanks
AEOLIN SANDS The Role of Eolian Processes in the Dynamics	Air Pollution Measurements From Satellites, W74-04485 5A	Alaska, W74-04412 8I
of a Shallow Accumulation Coast, W74-04440 2J	Environmental Chemistry: Air and Water Pol-	Permafrost Protection for Pipelines, W74-04415 20
AERATION	lution,	
Screening Aerator Concentrator,	W74-04513 5B	Permafrost-Related Engineering Geology Problems Posed by the Trans-Alaska Pipeline,
W74-04712 5D Process for Purifying Water that Contains Or-	Pollutant Removal Handbook, W74-04527 5D	W74-04416 8I
ganic Matter,	Waste Automotive Lubricating Oil as a Mu-	Long-Term Effects of Vegetative Cover of
W74-04716 5D	nicipal Incinerator Fuel, W74-04549 5D	Permafrost Stability in an Area of Discontinu ous Permafrost, W74-04417
AERATORS Screening Aerator Concentrator,		
W74-04712 5D	Polluted Snow in Southern Norway During the Winters 1968-1971,	Stability of an Underground Room in Froze Gravel,
AERIAL PHOTOGRAPHY	W74-04652 5B	W74-04418 20
Remote Sensing in Sampling Site Location in	ALABAMA	Encountering Massive Ground Ice During Roa
Lakes and Streams, W74-04313 5A	Surface-Water Availability, Lauderdale Coun- ty, Alabama,	Construction in Central Alaska, W74-04420 46
	W74-04494 2E	
A Geoecological Terrain Analysis of Discon- tinuously Frozen Ground in the Upper Macken-	Prattville, Alabama Community Development	The Use of Polyurethane Foam Plastics in th Construction of Expedient Roads on Per
zie River Valley, Canada,	Plan, Vol. II: Summary and Illustrations.	mafrost in Central Alaska,
W74-04354 2C	W74-04508 5D	W74-04421 86

ALGAE

ALGAE	ALLUVIUM	AQUATIC ANIMALS
Concerning Large-Scale Cultivation of Thermo- philic Cosmopolitan Mastigocladus Laminousus	Certain Structural and Developmental Coastal Features in the South of the Maritime Territo-	Temperature Acclimation in the Medusa, Chrysaora quinquecirrha,
Cohn (Cyanophyta) in Icelandic Hot Springs,	ry,	W74-04660 5C
W74-04486 2I	W74-04432 2J	Types of Distribution Pattern Among Fresh-
Calculation of the Concentration of the	ALPINE Permafrost and Its Relationship to Other En-	water Animals, (In Rumanian), W74-04840 2I
Biomass of Blue-Green Algae During Settling,	vironmental Parameters in a Midlatitude, High-	W /4-04840 21
(In Russian), W74-04645 5C	Altitude Setting, Front Range, Colorado Rocky Mountains,	AQUATIC ENVIRONMENT Temperature Requirements for Embryos and
A Possible Explanation for the Differences in	W74-04357 2C	Larvae of the Northern Pike, Esox lucius
the Fatty Acid Composition of Fresh-Water		(Linnaeus),
and Marine Fishes,	ALUM COAGULATION	W74-04670 5C
W74-04688 5C	Color Removal from Textile Dye Waste by	AQUATIC HABITATS
Comparative Study, in 1966 and 1967, of Three	Coagulation, W74-04303 5D	A Detailed Investigation of the Sociological,
Reservoirs in the Project of a Natural Park in	W/4-04303	Economic, and Ecological Aspects of Proposed
the Morvan Region (In French),	AMAZON REGION (RIO NEGRO)	Reservoir Sites in the Salt River Basin of Ken-
W74-04815 5C	Contribution to Knowledge about the Leaf Anatomy of Species of a 'Caatinga' of the Rio	tucky, W74-04310 2A
ALGAE (LIQUD PHASE)	Negro (Amazon), (In Portuguese),	A OUA TIC INCECTO
The Analysis of Arsenic in the Lipid Phase	W74-04682 2I	AQUATIC INSECTS Water Quality Requirements of Aquatic In-
from Marine and Limnetic Algae,	AMES (IOWA)	sects.
W74-04557 5A	Trickling Filter-Activated Sludge Combinations	W74-04551 5C
ALGAL ASSAY PROCEDURES	for Domestic Wastewater Treatment,	
Effect of Phosphorus Removal Processes on	W74-04798 5D	Ecological Investigations of Ponds with Special
Algal Growth,	ANGENER	Regard to the Consequences of Water Pollution
W74-04552 5C	AMINES Determination of Microgram Quantities of	by Oil, (In German), W74-04635 5C
	Polyethylene Polyamines in Water, (In Rus-	W 74-04033
ALGAL CONTROL	sian).	AQUATIC LIFE
Effect of Phosphorus Removal Processes on	W74-04701 5A	Biochemical Ecology of Water Pollution,
Algal Growth, W74-04552 5C	ALGARIA NITTO CENT	W74-04523 5C
1177-07572	AMMONIA NITROGEN Effects of Backpumping from South New	AQUEOUS SOLUTIONS
ALGAL GROWTH	River Canal at Pump Station S-9 on Quality of	Use of a Silver-Sulfide Electrode for Stan-
Chemical Ecology: Evidence for Phosphate as	Water in Water-Conservation Area 3, Broward	dardizing Aqueous Sulfide Solution in Deter-
the Only Factor Limiting Algal Growth in Lake	County, Florida,	mining Sulfide in Water,
Kinneret,	W74-04600 5B	W74-04777 5A
W74-04685 5C	ANALOG MODELS	AQUIFER CHARACTERISTICS
ALGAL OOZE	ANALOG MODELS The Analysis of Harbor and Estuary Systems,	Hydrogeologic Characteristics of the Surficial
Ecological Characteristics of Go-No-Ike Lake,	W74-04745 2L	Aquifer in Northwest Hillsborough County,
W74-04638 5C		Florida,
AT WAT THE PARTY REPTATO	ANALYTICAL TECHNIQUES	W74-04468 2F
ALKALINE EARTH METALS Water Cleaning Treatment,	Determination of the Complexing Capacity of Natural Water.	Reconnaissance of the Ground-Water
W74-04710 3A	W74-04312 2K	Resources of Cimarron County, Oklahoma,
		W74-04495 4B
ALLEGHENY RIVER BASIN (N Y)	Mass Spectrometry and Inhomogeneous Ion	ACUIPPEC
Chemical Quality of Streams, Allegheny River	Optics, W74-04475 5A	AQUIFERS The Response to Tidal Fluctuations of a Leaky
Basin and Part of the Lake Erie Basin, New York,	W14-04475 3A	Aquifer System,
W74-04593 2K	Analytical Techniques for the Determination of	W74-04308 2F
ZR	Petroleum Contamination in Marine Organisms,	
ALLUVIAL AQUIFERS	W74-04594 5A	Mississippian Aquifer of Iowa,
Availability of Ground Water in the Winnsboro	ANTARCTIC	W74-04843 70
Area, Louisiana,	Geophysical Identification of Frozen and Un-	ARCTIC
W74-04596 4B	frozen Ground, Antarctica,	Hydrology of the Central Arctic River Basins
ALLUVIAL CHANNELS	W74-04360 2C	of Alaska,
Thermal Disturbance Due to Channel Shifting,	Growth of Patterned Ground in Victoria Land,	W74-04304 2A
Mackenzie Delta, N.W.T., Canada,	Antarctica.	A Spatial Correlation Between Plant Distribu-
W74-04351 2C	W74-04367 2C	tion and Unfrozen Ground Within a Region of
A Groundwater Supply for an Oil Camp Near		Discontinuous Permafrost,
Prudhoe Bay, Arctic Alaska,	Soil Development and Patterned Ground Evolution in Beacon Valley Antarctica,	W74-04355 20
W74-04396 2F	W74-04372 2G	Permafrost Considerations in Land Use
Surface and County West Continues 5		Planning Management,
Surface- and Ground-Water Conditions During 1959-61 in a Part of Flett Creek Basin, Tacoma,	ANTARCTICA (BEACON VALLEY)	W74-04361 20
Washington.	Soil Development and Patterned Ground Evolution in Beacon Valley Antarctica.	Problems in the Origin of Massive Icy Beds
W74-04796 2E	W74-04372 2G	Western Arctic, Canada,
		W74-04369 20
ALLUVIAL FAN SOILS	ANTARCTICA (VICTORIA LAND)	
Water Regime in Alluvial Fan Soils of the	Growth of Patterned Ground in Victoria Land,	Groundwater Investigations in Permafrost Re
Araks River, (In Russian), W74-04733 2G	Antarctica, W74-04367 2C	gions of North America: A Review, W74-04391 21
20		

Effects of Permafrost on Stream Flow Characteristics in the Discontinuous Permafrost Zone	ARTIFICIAL PRECIPITATION Electric Cloud and Weather Modification with	BANK EROSION Slope Development on a Mississippi River
of Central Alaska, W74-04392 2C	Intense Relativistic Electron Beams, W74-04604 3B	Bluff in Historic Time, W74-04585 2J
Groundwater Pore Pressures Adjacent to Sub-	ASTERIONELLA-FORMOSA	BARRIER ISLANDS
arctic Streams,	The Phytoplankton Productivity in the Pyasina	Beach Profiles of a Georgia Barrier Island,
W74-04393 2C	River Near Tareya Village (Western Taimyr),	W74-04736 2J
A Groundwater Supply for an Oil Camp Near	(In Russian), W74-04698 2I	Eolian Cross-Bedding in the Beach Dune En-
Prudhoe Bay, Arctic Alaska,		vironment, Sapelo Island, Georgia,
W74-04396 2F	ATLANTIC COASTAL PLAIN Response and Recovery of a Piedmont	W74-04737 2J
The Nature of the Seawater-Freshwater Inter-	Watershed from Tropical Storm Agnes, June	High-Angle Beach Stratification, Sapelo Island,
face During Breakup in the Colville River	1972, W74-04805 2J	Georgia,
Delta, Alaska, W74-04397 2C	W 74-04803 23	W74-04738 2J
	ATLANTIC OCEAN	BARRIERS
Potential Use of Airborne Dual-Channel In- frared Scanning to Detect Massive Ice in Per-	Hydrocarbon and Chlorophyll: A Correlation in the Upwelling Region off West Africa,	Anti-Pollution Barrier, W74-04705 5G
mafrost,	W74-04771 5B	
W74-04403 7B	AUSTRALIA	BARROW (ALASKA) Stratigraphy and Diagenesis of Perennially
Water Supply and Waste Disposal Concepts	Linear Systems Technique Applied to	Frozen Sediments in the Barrow, Alaska, Re-
Applicable in Permafrost Regions,	Hydrologic Data Analysis and Instrument	gion,
W74-04405 5D	Evaluation: A Case Study on Data from the Alice Springs Area,	W74-04365 2C
Settlement Associated with the Thawing of Per-	W74-04470 2A	BASE FLOW
mafrost,	Solar Energy for the Concentration of Pulp Mill	The Response to Tidal Fluctuations of a Leaky
W74-04408 2C	Effluents,	Aquifer System, W74-04308 2F
Thermal Regime in an Arctic Earthfill Dam,	W74-04544 5D	
W74-04410 8D	Hydrologic Investigation and Design in Urban	BASELINE STUDIES Baseline Quality Data for Kalihi Stream,
Control of Culvert Icing,	AreasA Review,	W74-04309 5B
W74-04411 4C	W74-04597 2A	Suspended and Bedload Sediment Transport in
Permafrost-Related Engineering Geology	A Design Procedure for the Conjunctive Use of	the Snake and Clearwater Rivers in the Vicinity
Problems Posed by the Trans-Alaska Pipeline,	Surface and Groundwater Storages, W74-04598 4B	of Lewiston, Idaho,
W74-04416 8D		W74-04846 21
The Use of Polyurethane Foam Plastics in the	Hydrologic Data for Small Rural Catchments in Australia, 1973,	BASS
Construction of Expedient Roads on Per-	W74-04842 2E	Effects of Temperature on Developing Meristic
mafrost in Central Alaska, W74-04421 8G	AVI FAUNA	Structures of Smallmouth Bass, Micropterus dolomieui Lacepede,
W/4-04-21	Changes in the Avifauna of the Biesbosch in	W74-04663 50
Radio Depth-Sounding on Meighen and Barnes Ice Caps, Arctic Canada,	the 1st Yr After the Elimination of the Tide, W74-04699 2I	BATHYMETRY
W74-04571 2C		Sedimentation in Hawke Bay,
The Water Dalamaia Andia and October Da	BACILLARIOPHYTA	W74-04726 21
The Water Balance in Arctic and Subarctic Re- gionsAnnotated Bibliography and Preliminary	Phytoplankton Dynamics in the Severskiy Donets River for the First Years After its	BAY-BARS
Assessment,	Regulation, (In Russina),	Morphology and Evolution of aLagoon Coas
W74-04601 2C	W74-04648 5C	on Sakhalin, W74-04433 2.
ARGENTINA (PAMPASIC REGION)	BACKPUMPING	
Ecology and Biocoenology of Lagunas or	Effects of Backpumping from South New River Canal at Pump Station S-9 on Quality of	BAYS Hurricane Tide Prediction for New York Bay,
Lakes of Third Order of the Temperate Neotropical Region (Southeast Pampasic Re-	Water in Water-Conservation Area 3, Broward	W74-04343 21
gion of Argentina), (In Spanish),	County, Florida,	Dynamics and Morphology of Sea Coasts.
W74-04817 2H	W74-04600 5B	W74-04425 2.
ARIZONA	BACTERIA	Some Results of Regional Coastal Investiga
Vertical Distribution of Fishes Relative to	Distribution of Organic Matter and Bacteria in the Upper Layer of Bottom Deposit of Lake	tions in the USSR,
Physical, Chemical and Biological Features in Two Central Arizona Reservoirs,	Balaton,	W74-04426 2
W74-04474 5C	W74-04839 5B	History of the Formation of the Coasts of
ARKANSAS	BACTERIUM	Kara-Bogaz-Gol,
Mathematical Modeling of Stream Storage	A Find of Marsh Sandpiper Tringa stagnatilis in	W74-04427 2
Potential,	the Netherlands, W74-04681 5C	Recent Development of the Temryuk Coast or
W74-04305 2E		the Azov Sea, W74-04430 2
ARSENIC	BAER'S LAW The Fallacy of Baer's Law or Coriolis' Effect	W74-04430 2
The Analysis of Arsenic in the Lipid Phase	on the Meandering of Rivers,	Certain Structural and Developmental Coasta
from Marine and Limnetic Algae, W74-04557 5A	W74-04799 8B	Features in the South of the Maritime Territory,
	BALTIC SEA	W74-04432 2
Spectrophotometric Estimation of Arsenic in Nitric Acid Extracts of Soil and Soil Additives,	The Use of Computer Simulations for Systems Ecological Studies in the Baltic,	Constituent Transport in Estuaries,
W74-04769 5A	W74-04634 5B	

BAYS

Feasibility Study for a Surge-Action Mode Monterey Harbor, California, W74-04721	l of 2L	Wave Period and the Swash Zone Energy Balance, W74-04622 2J	BEET SPECIES Potential Intensity of Photosynthesis in Some Tomato and Beet Species Under Different Soil
Sea Waves and Beach Cusps,	21	SURF.	Moisture, (In Russian),
W74-04734	2J	W74-04725 2J	W74-04691 3F
BEACH EROSION		Selected Bibliography on Beach Features and	BENEFITS
Mean Direction of Waves and of Wave Ener W74-04328	rgy, 2J	Related Nearshore Processes. W74-04728 2J	Benefit of Water Pollution Control on Property Values,
The Deletionship Determine Many Asting			W74-04550 5G
The Relationship Between Wave Action Beach Profile Characteristics, W74-04331	2J	Research in the Coastal and Oceanic Environ- ment. A Summary of Research Accomplished Under Project Themis,	BENTHIC FAUNA Benthic Fauna of a Tropical Man-Made Lake
Littoral Transport in the Great Lakes, W74-04334	2Ј	W74-04732 2L	(Volta Lake, Ghana 1965-1968), W74-04636 2H
Wave Effect on the Coast Formation and l		Sea Waves and Beach Cusps, W74-04734 2J	The Transport of Organic Carbon to Organisms
sion,		Beach Profiles of a Georgia Barrier Island,	Living in the Deep Oceans, W74-04790 5C
W74-04335	2J	W74-04736 2J	BENTHIC FLORA
The Occurrence and Characteristics	of	Eolian Cross-Bedding in the Beach Dune En-	Production of Epilithiphyton in Two Lakes of
Nearshore Permafrost, Northern Alaska, W74-04359	2C	vironment, Sapelo Island, Georgia,	the Experimental Lakes Area, Northwestern Ontario,
Dynamics and Morphology of Sea Coasts.		W74-04737 2J	W74-04787 5C
W74-04425	2J	High-Angle Beach Stratification, Sapelo Island,	BENTHOS
Study of Beach Widening By the Perc	ched	Georgia, W74-04738 2J	A Detailed Investigation of the Sociological,
Beach Concept, Santa Monica Bay, Californ W74-04603		Rhomboid Ripple Mark, Indicator of Current	Economic, and Ecological Aspects of Proposed Reservoir Sites in the Salt River Basin of Ken-
		Direction and Environment,	tucky,
Collective Movement of Sediment in Litt Environment.	toral	W74-04739 2J	W74-04310 2A
W74-04621	2J	Transformation, Breaking and Run-Up of a Long Wave of Finite Height,	Micro- and Mesobenthos Development as a Factor of Soil Composition (In Russian),
Floating Breakwater Pontoon, W74-04711	on	W74-04741 2L	W74-04816 2H
W/4-04/11	8B	On Non-Saturated Breakers and the Wave Run-	Vertical Distribution of Zoobenthos of the
SURF, W74-04725	2J	Up, W74-04742 2L	Mountain River of Adzhar ASSR (In Russian), W74-04818
Dhenomena Affecting Improvement of	the		
Phenomena Affecting Improvement of Lower Columbia Estuary and Entrance, W74-04763	2L	Flume Experiments on Sand Transport by Waves and Currents, W74-04746 2L	Some Data on the Post-Glacial Transgression
	46	W/4-04/40	of the Bering Sea, W74-04431
BEACHES Growth of Longshore Currents Downstream	m of	Laboratory Study of Scale Effects in Two- Dimensional Beach Processes,	BIBLIOGRAPHIES
a Surf-Zone Barrier, W74-04324	2J	W74-04748 2L	Distribution of Permafrost in North America
		Longshore Currents in One and Multi-Bar	and Its Relationship to the Environment: A
Mean Direction of Waves and of Wave Ene W74-04328	rgy, 2J	Profiles Relation to Littoral Drift, W74-04749 2L	Review, 1963-1973, W74-04353 2C
Shores and Shore Processes,		Laboratory Applications of Redicionaries	Mapping and Predicting Permafrost in North
W74-04339	2L	Laboratory Applications of Radioisotopic Tracers to Follow Beach Sediments,	America: A Review, 1963-1973, W74-04398 2C
Sediment Movement at Indian Ports,		W74-04751 2J	
W74-04345	2L	Drastic Beach Changes in a Low-Energy En-	Engineering Design and Construction in Per- mafrost Regions: A Review,
The Occurrence and Characteristics Nearshore Permafrost, Northern Alaska,	of	vironment Caused by Hurricane Betsy, W74-04756 2J	W74-04404 8D
W74-04359	2C	Development and Geologic Significance of Soft	Southwestern Groundwater Law: A Textual
The Role of Eolian Processes in the Dynamics	mics	Beach Sand, W74-04757 2J	and Bibliographic Interpretation, W74-04460 4B
of a Shallow Accumulation Coast, W74-04440	2Ј		
		Quantitative Tracing of Littoral Drift,	World Desertification: Cause and Effect. A Literature Review and Annotated Bibliography,
Effect of Beach Slope and Shoaling on W Asymmetry,		W74-04617 2J	W74-04461 3B
W74-04612	2E	The Calculation of Critical Discharge Velocity	Community Water Supply.
Variable Dispersion and Its Effects on Movements of Tracers on Beaches,	the	of Streams in Uniform Flow and the Trans- ported Sediment Size,	W74-04510 4B
W74-04618	2Ј	W74-04800 2J	Housing and Planning References. W74-04511 3D
A Field Investigation of Sand Transport in	the	The Problem of Critical Discharge in Sediment	
Surf Zone, W74-04619	2J	Motion, W74-04801 2J	Plant Responses to Water Stress, W74-04539 21
The Effect of Waves on the Profile of a N		BED UNDER WATER	1972 Review of the Literature on Pulp and
ral Beach,		SURF,	Paper Effluent Management,
W74-04620	2J	W74-04725 2J	W74-04540 5D

The Water Balance in Arctic and Subarctic Re-	BIOMASS	Waves and Tides Near the Shore,
gionsAnnotated Bibliography and Preliminary	Calculation of the Concentration of the	W74-04758 2L
Assessment,	Biomass of Blue-Green Algae During Settling,	M. P.C. al. and Co. al.
W74-04601 2C	(In Russian),	Modification of Wave Spectra on the Continen- tal Shelf and in the Surf Zone,
Field Investigation Practices of Coastal Studies	W74-04645 5C	W74-04762 2L
in Japan,	BLEACHING WASTES	
W74-04625 2L	Color of Pulp Industry Waste Liquors. III. The	BOTTOM PRESSURE
Selected Bibliography on Beach Features and	Interaction of Chloro-Oxylignin with Metal	Investigation of Seiche Activity in West Coast Harbors.
Related Nearshore Processes.	Salts (In Japanese),	W74-04744 2L
W74-04728 2J	W74-04512 5D	***************************************
4 4 4 4 4 4 8 8 8 8 4 FM 15 4 15	Effects of Condensates on the Toxicity of	BOTTOM SEDIMENTS
An Annotated Bibliography of Flushing and Dispersion in Tidal Waters.	Kraft Pulp Mill Effluents,	Developmental History and Present-Day
W74-04731 2L	W74-04521 5D	Dynamics of the Chushka Spit, W74-04428
	Application of Polyacrylamide to Pulp Mill Ef-	117-04420
BIOACCUMULATION	fluents (In Japanese),	Some Data on the Post-Glacial Evolution of
Mercury Uptake and Ion Distribution in Gills of Rainbow Trout (Salmo gairdneri): Tissue	W74-04529 5D	Karkinit Bay and the Accumulation of Bottom
Scans with an Electron Microprobe,		Sediments Within it, W74-04429
W74-04778 5A	Study of Pulp and Paper Industry's Effluent	W 14-04429
	Treatment.	Recent Development of the Temryuk Coast on
BIOASSAY	W74-04538 5D	the Azov Sea,
Effect of Phosphorus Removal Processes on Algal Growth,	1972 Review of the Literature on Pulp and	W74-04430 2J
W74-04552 5C	Paper Effluent Management,	BOTTOM SLIP CURRENTS
117701352	W74-04540 5D	Numerical Computations of Storm Surges with
The Effects of Methoxychlor on Aquatic Biota,	POG 14400	Bottom Stress,
W74-04553 5C	BOG MASS	W74-04759 2I
Calculation of the Concentration of the	Ridge-Pool Complex Formation of Khotkhur- sky Bog Mass (In Russian),	BOTTOM STRESS
Biomass of Blue-Green Algae During Settling,	W74-04812 3F	Numerical Computations of Storm Surges with
(In Russian),		Bottom Stress,
W74-04645 5C	BOGS	W74-04759 2L
Apparatus for Recording Avoidance Move-	Bog Vegetation Re-Mapped after Sixty Years:	
ments of Fish.	Studies on Skagershultamossen, Central	BOTTOM TOPOGRAPHY
W74-04776 5A	Sweden, W74-04683 2I	Propagation of a Finite-Amplitude Surface
	W/4-04063	Wave With Allowance for Random Irregulari- ties of the Bottom.
Bioassay Procedures to Evaluate Acute Toxici-	BOILING WATER REACTOR	W74-04841 2
ty of Neutralized Bleached Kraft Pulp Mill Ef- fluent to Pacific Salmon,	Aerial Radiological Measuring Survey of the	
W74-04779 5C	Area Surrounding the La Crosse Boiling Water	BRAZIL (NORTHEAST)
	Reactor, Genoa, Wisconsin, July 1968.	Cost-Benefit Analysis of Irrigation Projects in
Effects of Cadmium and Copper on the Oxida-	W74-04447 5A	Northeastern Brazil, W74-04565 31
tion of Lactate by Rainbow Trout (Salmo gaird-	Aerial Radiological Measuring Survey of the	W 74-04303
nert) Gills, W74-04780 5C	Area Surrounding the Vermont Yankee	BREAKER ZONE
11777700	Generating Station and the Yankee Nuclear	Effect of Beach Slope and Shoaling on Wave
Diurnal Variation of Dissolved Inorganic Car-	Power Station, September 18, 1970.	Asymmetry,
bon and its Use in Estimating Primary Produc-	W74-04448 5A	W74-04612 2E
tion and CO2 Invasion in Lake 227, W74-04784 5A	BOREHOLE GEOPHYSICS	BREAKING WAVES
W/4-04/04	Evaluation of in Situ Creep Properties of	Waves in Shoaling Water,
BIOCENOLOGY	Frozen Soils with the Pressuremeter,	W74-04338 8I
Ecology and Biocoenology of Lagunas or	W74-04377 2C	Barabias Ware Criteria A Study Employing
Lakes of Third Order of the Temperate	To Olive Manifester Levil at December of Dec	Breaking Wave Criteria; A Study Employing a Numerical Wave Theory,
Neotropical Region (Southeast Pampasic Re- gion of Argentina), (In Spanish),	In Situ Physicomechanical Properties of Per- mafrost Using Geophysical Techniques,	W74-04610 21
W74-04817 2H	W74-04399 2C	
		Wave Period and the Swash Zone Energy
BIOCHEMICAL OXYGEN DEMAND	BOREHOLES	Balance,
Apparatus for Treating Industrial and Domestic Waste Waters.	Deep Temperature Observations in the Canadi-	W74-04622 2
W74-04707 5D	an North,	Transformation, Breaking and Run-Up of
	W74-04349 2C	Long Wave of Finite Height,
BIODEGRADATION	BORES	W74-04741 21
Relative Susceptibility of Lakes to Water-	The Effects of Bottom Configuration on the	On Non-Saturated Breakers and the Wave Run
Quality Degradation in the Southern Hood Canal Area, Washington,	Deformation, Breaking and Run-Up of Solitary	Up,
W74-04488 5B	Waves,	W74-04742 21
	W74-04613 2E	
A New Secondary Treatment.	BOTTOM CONFIGURATION	BREAKWATERS Wave Action and Breakwater Design Hamili
W74-04524 5D	The Effects of Bottom Configuration on the	Wave Action and Breakwater Design, Hamli Beach Harbor, New York,
BIOLOGICAL TREATMENT	Deformation, Breaking and Run-Up of Solitary	W74-04588 81
200 MGD Activated Sludge Plant Removes	Waves,	
Phosphorus by Pickle Liquor,	W74-04613 2E	Floating Breakwater Pontoon,
W74-04554 5D	BOTTOM FRICTION	W74-04711 8
Method and Apparatus for the Biological Treat-	Wave Forecasting Relationships for the Gulf of	BREEDER REACTORS
ment of Waste Water,	Mexico,	Breeder Reactors: Power for the Future,
W74-04709 5D	W74-04729 2E	W74-04656 8

6B

BREWERIES		
BREWERIES	CANADA	The Effect of Collecting Time and Grain Size
Clarification Method of Polluted Water from	Accumulation on the Devon Island Ice Cap,	on the Sampling of Stream Sediments for
Paper Mills With Combination of Beer Effluent	Northwest Territories, Canada,	Geochemical Mapping in the St. Catharines
(In Japanese),	W74-04325 2C	Area, Ontario,
W74-04528 5D	Influence of Climatic and Terrain Factors on	W74-04587 2J
BRIDGES	Ground Temperatures at Three Locations in	Heterotrophic Utilization of Sucrose in an Ar-
Hydraulic Performance of BridgesExcava-	the Permafrost Region of Canada,	tificially Enriched Lake,
tions at Bridges,	W74-04348 2C	W74-04781 5C
W74-04482 8B		W 14-04/61 SC
	Deep Temperature Observations in the Canadi-	Measurement of Adenosine Triphosphate
BUBBLES	an North,	(ATP) in Two Precambrian Shield Lakes of
Development and Geologic Significance of Soft	W74-04349 2C	Northwestern Ontario,
Beach Sand,	Thermal Disturbance Due to Channel Shifting,	W74-04782 5B
W74-04757 2J	Mackenzie Delta, N.W.T., Canada,	Diurnal Variation of Dissolved Inorganic Car-
BUOYANCY	W74-04351 2C	bon and its Use in Estimating Primary Produc-
Buoyancy Spread of Waste Water in Coastal	A Consological Tamein Analysis of Discon	tion and CO2 Invasion in Lake 227,
Regions,	A Geoecological Terrain Analysis of Discon- tinuously Frozen Ground in the Upper Macken-	W74-04784 5A
W74-04630 5B	zie River Valley, Canada,	
Zone of Flow Fatablishment for Bound	W74-04354 2C	Distribution and Uptake of Artificially In-
Zone of Flow Establishment for Round Buoyant Jets,		troduced Radium-226 in a Small Lake,
W74-04657 5B	A Spatial Correlation Between Plant Distribu-	W74-04785 5B
W/4-0403/	tion and Unfrozen Ground Within a Region of	Production of Epilithiphyton in Two Lakes of
On the Stability of Laminar Plumes: Some Nu-	Discontinuous Permafrost,	the Experimental Lakes Area, Northwestern
merical Solutions and Experiments,	W74-04355 2C	Ontario,
W74-04662 5B	Indirect Mapping of the Snowcover for Per-	W74-04787 5C
PURPORTORS	mafrost Prediction at Schefferville, Quebec,	
BYPRODUCTS	W74-04356 2C	A Syringe Gas-Stripping Procedure for Gas-
Finland Starts Production of Protein from Black Liquor.		Chromatographic Determination of Dissolved
W74-04526 5D	Postglacial Permafrost Features in Eastern	Inorganic and Organic Carbon in Fresh Water
117704320	Canada, W74-04358 2C	and Carbonates in Sediments,
CAATINGA	W74-04358 2C	W74-04788 5A
Contribution to Knowledge about the Leaf	Permafrost and Snowcover Relationships Near	Eutrophication of Lake 227 by Addition of
Anatomy of Species of a 'Caatinga' of the Rio	Schefferville,	Phosphate and Nitrate: The Second, Third, and
Negro (Amazon), (In Portuguese),	W74-04362 2C	Fourth Years of Enrichment, 1970, 1971, and
W74-04682 2I	terdies at the Timesian A Description Emperi	1972,
CADMIUM	studies at the Timmins 4 Permafrost Experi- mental Site,	W74-04789 5C
Effects of Cadmium and Copper on the Oxida-	₹/74-04363 2C	
tion of Lactate by Rainbow Trout (Salmo gaird-	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	CANADA (QUEEN CHARLOTTE SOUND)
nert) Gills,	Thermokarst Development, Banks Island,	Reproduction of Estuarine Structure and Cur-
W74-04780 5C	Western Canadian Arctic,	rent Observation Techniques in the Hecate
CATTEONATA	W74-04368 2C	Model, W74-04724 2L
CALIFORNIA	Problems in the Origin of Massive Icy Beds,	W74-04724 2L
Multi-Dimensional Aspects of Eddy Diffusion Determined by Dye Diffusion Experiments in	Western Arctic, Canada,	CANALS
Coastal Waters (Summary),	W74-04369 2C	The Rajasthan Canal Area: A Settlement Struc-
W74-04322 2L		ture,
7777322	Rates of Mass Wasting in the Ruby Range,	W74-04499 6D
Mean Direction of Waves and of Wave Energy,	Yukon Territory,	
W74-04328 2J	W74-04371 2J	Effects of Backpumping from South New
Study of Book Widowing By the Booked	In Situ Physicomechanical Properties of Per-	River Canal at Pump Station S-9 on Quality of
Study of Beach Widening By the Perched	mafrost Using Geophysical Techniques,	Water in Water-Conservation Area 3, Broward
Beach Concept, Santa Monica Bay, California, W74-04603 8B	W74-04399 2C	County, Florida,
W74-04003	m	W74-04600 5B
Waves at Camp Pendleton, California,	The Application of Shallow Seismic Methods to Mapping of Frozen Surficial Materials,	CAPE HENLOPEN (DEL
W74-04607 2E	W74-04401 2C	A Refraction Study and Program for Periodic
G - 12 - 12 - 12 - 1	177-04101	Waves Approaching a Shoreline, and Extend-
Constituent Transport in Estuaries,	Effects of Ground-Ice Variability and Resulting	ing Beyond the Breaking Point,
W74-04627 2L	Thaw Settlements on Buried Warm-Oil	W74-04340 8B
Feasibility Study for a Surge-Action Model of	Pipelines,	CABILLABY ACTION
Monterey Harbor, California,	W74-04422 4C	CAPILLARY ACTION
W74-04721 2L	Performance of a Warm-Oil Pipeline Buried in	Convective Heat Transfer to Water Containing
	Permafrost,	Bubbles: Enhancement not Dependent on Ther- mocapillarity,
Investigation of Seiche Activity in West Coast	W74-04423 8D	W74-04664 8B
Harbors, W74-04744 2L		0.501
W74-04744 2L	Nutrients in Subsurface and Runoff Waters of	CAPITALIZATION OF BENEFITS
Tracing Coastal Sediment Movement by Natu-	the Holland Marsh, Ontario, W74-04478	Capitalization of the Benefits of Water

W74-04478

W74-04490

Ice Caps, Arctic Canada, W74-04571

Application of the Concept of Rectilinear Vortices to the Movement of Oil Slicks,

Radio Depth-Sounding on Meighen and Barnes

2J

21

5B

2C

Resource Development,

Diurnal Variation of Dissolved Inorganic Carbon and its Use in Estimating Primary Production and CO2 Invasion in Lake 227,

W74-04501

W74-04784

CARBON

rally Radioactive Minerals,

Influence of Environmental Moisture Condi-

tions on the Phenol Compound Amount in Cal-

W74-04753

CALLUNA-VULGARIS

luna Vulgaris L., W74-04487

A Numerical Model for Determining Integral Primary Production and Its Application to Lake	CHAOBORID Benthic Fauna of a Tropical Man-Made Lake	CHLORELLA Subglacial Development of Chlorella in Baikal,
Michigan, W74-04786 5C	(Volta Lake, Ghana 1965-1968), W74-04636 2H	(In Russian), W74-04647 2H
Production of Epilithiphyton in Two Lakes of		CHLORIDES
the Experimental Lakes Area, Northwestern Ontario.	CHEMCONTROL Application of Polyacrylamide to Pulp Mill Ef-	Availability of Ground Water in the Winnsboro Area, Louisiana,
W74-04787 5C	fluents (In Japanese), W74-04529 5D	W74-04596 4B
Eutrophication of Lake 227 by Addition of Phosphate and Nitrate: The Second, Third, and	Hydrogen Peroxide for Industrial Pollution	CHLORINATED HYDROCARBON PESTICIDES
Fourth Years of Enrichment, 1970, 1971, and	Control, W74-04532 5D	A Preliminary Survey of the Possible Con- tamination of Lake Nakuru in Kenya with
1972, W74-04789 5C	CHEMICAL ANALYSIS	Some Metals and Chlorinated Hydrocarbon Pesticides.
CARBONACEOUS WASTES	Chemical Quality of Streams, Allegheny River	W74-04547 5C
Method and Apparatus for the Biological Treat-	Basin and Part of the Lake Erie Basin, New	CHLORINATION
ment of Waste Water, W74-04709 5D	York, W74-04593 2K	Hypochlorination of Polluted Storm-Water Pumpage at New Orleans,
CARR	Applying Tarkeiner for the Determination of	W74-04676 5D
CARP Thermal Responses in Cirrhina mrigala Fry,	Analytical Techniques for the Determination of Petroleum Contamination in Marine Organisms,	W
W74-04661 5C	W74-04594 5A	Water Purification, W74-04706 5F
CARP FEEDING	CHEMICAL INDUSTRY	CHLOROPHYLL
Feeding of Juvenile Carp Cyprinus carpio L. in the Arakum Bodies of Water (Delta of the	Water Pollution in the Netherlands,	Hydrocarbon and Chlorophyll: A Correlation in
Terek River) at Early Developmental Stages,	W74-04536 5B	the Upwelling Region off West Africa, W74-04771 5B
(In Russian),	CHEMICAL PRECIPITATION	W74-04771 5B
W74-04649 2L	Extensive Effluent Treatment at Hodge In-	CHLOROPHYTA
CASPIAN SEA	cludes Color Removal.	A Possible Explanation for the Differences in the Fatty Acid Composition of Fresh-Water
Water Level Fluctuations of the Caspian Sea	W74-04525 5D	and Marine Fishes.
(K probleme urovennogo rezhima Kaspiyskogo morya),	Clarification Method of Polluted Water from	W74-04688 5C
W74-04575 2H	Paper Mills With Combination of Beer Effluent (In Japanese),	CHROMATOGRAPHIC ANALYSIS
CATION ADSORPTION	W74-04528 5D	Thin-Layer and Gas-Chromatographic Deter-
Aspects of Colour Removal from Pulp and		mination of Phenols Present in Water, (In Ger-
Paper Mill Effluents, W74-04514 5D	Mercury Removal from Waste Water with Starch Xanthate-Cationic Polymer Complex,	man), W74-04684 5A
	W74-04541 5D	CHROMATOGRAPHY
CATION EXCHANGE Mercury Removal from Waste Water with	CHEMICAL WASTES	Analytical Techniques for the Determination of
Starch Xanthate-Cationic Polymer Complex, W74-04541 5D	Catalytic Oxidation and Thermal Treatment of Waste Waters (Kataliticheskoe okislenie i ter-	Petroleum Contamination in Marine Organisms, W74-04594 5A
	micheskoe obezvrezhivanie stochnykh vod),	CHROMIUM
CATIONS Color of Pulp Industry Waste Liquors. III. The	W74-04537 5D	Determination of Chromium in Sea Water by
Interaction of Chloro-Oxylignin with Metal	CHEMICALS	Atomic Absorption Spectrometry,
Salts (In Japanese),	Pollutant Removal Handbook,	W74-04516 5A
W74-04512 5D	W74-04527 5D	CHRYSOPHYTA
CELLULOSE ACETATE MEMBRANE	CHESAPEAKE BAY	Phytoplankton Dynamics in the Severskiy
Water Cleaning Treatment, W74-04710 3A	Temperature Acclimation in the Medusa,	Donets River for the First Years After its Regulation, (In Russina),
	Chrysaora quinquecirrha, W74-04660 5C	W74-04648 50
CENTO Cento Seminar on the Application of Remote	W74-04660 5C	CHUM SALMON
Sensors in the Determination of natural	CHINA	Pink and Chum Salmon Culture,
Resources.	Trans-Pacific Fallout and Protective Counter- measures,	W74-04797
W74-04567 7B	W74-04454 5B	CIRCULATION
CESIUM	CHITTO CHOLUD LE	Modification of Nearshore Currents by Coasta
Annual Consumption of Cesium-137 and Cobalt-60 Labeled Pine Seeds by Small Mam-	Feeding of Juvenile Carp Cyprinus carpio L. in	Structures, W74-04341 8E
mals in an Oak-Hickory Forest,	the Arakum Bodies of Water (Delta of the	
W74-04450 5B	Terek River) at Early Developmental Stages,	The Possibility of Predicting Longshore Currents in Tideless Seas,
Strontium-90 and Cesium-137 Levels in Soils of	(In Russian), W74-04649 2L	W74-04439 21
Various Types at Niigata Prefecture, Japan, W74-04453 5B	CHIRONOMIDS	An Annotated Bibliography of Flushing and
	Benthic Fauna of a Tropical Man-Made Lake	Dispersion in Tidal Waters,
A Laboratory Investigation of Free Surface	(Volta Lake, Ghana 1965-1968),	W74-04731 21
Flows Over Wavy Beds,	W74-04636 2H	New Dimensions in Estuary Classification,
W74-04477 8B	CHIRONOMUS SPP	W74-04735 21
CHANNELS	Chironomidae (Diptera) from the Area of	CITIES
Wave Reflection and Transmission in Channels	Freiburg in Breisgau (with Special Considera- tion of the Genus Chironomus), (In German),	What Do We Mean by Metropolitan Water
of Variable Section, W74-04614 8B	W74-04678 2H	Management Institutions., W74-04498 6B

CLADOCERA

CLADOCERA Feeding of Juvenile Carp Cyprinus carpio L. in	COASTAL ENGINEERING Study of Beach Widening By the Perched	COHO SALMON Bioassay Procedures to Evaluate Acute Toxici-
the Arakum Bodies of Water (Delta of the Terek River) at Early Developmental Stages,	Beach Concept, Santa Monica Bay, California, W74-04603 8B	ty of Neutralized Bleached Kraft Pulp Mill Ef- fluent to Pacific Salmon,
(In Russian), W74-04649 2L	Field Investigation Practices of Coastal Studies	W74-04779 5C
CLASSIFICATION	in Japan, W74-04625 2L	COLD REGIONS Water Supply and Waste Disposal Concepts
A Numerical Classification of Selected Land- slides of the Debris Slide-Avalanche-Flow	The Atlantic Coast of Long Island,	Applicable in Permafrost Regions, W74-04405 5D
Type, W74-04591 2J	W74-04626 8A	COLD WEATHER CONSTRUCTION
CLAY	Selected Bibliography on Beach Features and Related Nearshore Processes.	Engineering Design and Construction in Per-
Influences of Soil Density, Clay Silt and Humus Content on Measurements of Soil	W74-04728 2J	mafrost Regions: A Review, W74-04404 8D
Water by Neutron Gauges, (In German),	COASTAL STRUCTURES	COLOR
W74-04556 2G	Mean Direction of Waves and of Wave Energy, W74-04328 2J	Color of Pulp Industry Waste Liquors. III. The Interaction of Chloro-Oxylignin with Metal
CLAYS Quickclays as Products of Glacial Action: A	Mechanical Bypassing of Littoral Drift at In-	Salts (In Japanese),
New Approach to Their Nature, Geology, Dis-	lets,	W74-04512 5D
tribution and Geotechnical Properties, W74-04590 2G	W74-04337 2L	Aspects of Colour Removal from Pulp and
	Modification of Nearshore Currents by Coastal Structures.	Paper Mill Effluents, W74-04514 5D
CLIMATE Feasibility Study for a Surge-Action Model of	W74-04341 8B	
Monterey Harbor, California,	COASTAL VEGETATION	Extensive Effluent Treatment at Hodge Includes Color Removal.
W74-04721 2L	Coastal-Water Vegetation of the Lower	W74-04525 5D
CLIMATIC CHANGE	Reaches of the Dnestr (In Russian),	COLOR REMOVAL
World Desertification: Cause and Effect. A Literature Review and Annotated Bibliography,	W74-04813 2L	Color Removal from Textile Dye Waste by
W74-04461 3B	COASTS	Coagulation, W74-04303 5D
CLIMATOLOGY	Harmonic Generation of Shallow Water Waves Over Topography,	
Summary Report of Metromex Studies, 1971-	W74-04323 2E	COLORADO Permafrost and Its Relationship to Other En-
1972. W74-04509 2B	Mean Direction of Waves and of Wave Energy, W74-04328 2J	vironmental Parameters in a Midlatitude, High- Altitude Setting, Front Range, Colorado Rocky
CLOSTRIDIUM-BOTULINUM		Mountains,
A Find of Marsh Sandpiper Tringa stagnatilis in the Netherlands,	A Review of Oceanographic Variables and Their Analyses and Predictions Over the Con-	W74-04357 2C Lakes in the Boulder-Fort Collins-Greeley
W74-04681 5C	tinental Shelf, W74-04329 2L	Area, Front Range Urban Corridor, Colorado,
CLOUD PHYSICS Summary Report of Metromex Studies, 1971-	Mechanical Bypassing of Littoral Drift at In-	W74-04496 2H
1972.	lets,	COLORIMETRIC ANALYSIS
W74-04509 2B Electric Cloud and Weather Modification with	W74-04337 2L A Refraction Study and Program for Periodic	Determination of Microgram Quantities of Polyethylene Polyamines in Water, (In Rus-
Intense Relativistic Electron Beams, W74-04604 3B	Waves Approaching a Shoreline, and Extending Beyond the Breaking Point,	sian), W74-04701 5A
	W74-04340 8B	COLUMBIA RIVER
CNOIDAL WAVE THEORY Shallow Water Waves: A Comparison of Theo-	Waves at Camp Pendleton, California,	Boise Cascade Paper Mill and St. Helens Share
ries and Experiments, W74-04609 2E	W74-04607 2E	Treatment Lagoon. W74-04535 5D
	Hyperbolic Waves and Their Shoaling,	Phenomena Affecting Improvement of the
CNOIDAL WAVES The Solitary Wave.	W74-04611 2E	Lower Columbia Estuary and Entrance,
W74-04326 8B	Field Investigation Practices of Coastal Studies	W74-04763 2L
COAGULANTS	in Japan, W74-04625 2L	COMMERCIAL DEVELOPMENT
Color Removal from Textile Dye Waste by		Death of the Marshes in the Ardennes, W74-04686 4A
Coagulation, W74-04303 5D	Feasibility Study for a Surge-Action Model of Monterey Harbor, California,	COMMITTEE ON WATER RESOURCES
	W74-04721 2L	RESEARCH
COAGULATION Color Removal from Textile Dye Waste by	Shore Transport. Formation of Sand Spits and	Federal Water Resources Research Program
Coagulation,	Tombolos, W74-04722 2J	for 1971. W74-04848 9D
W74-04303 5D		COMPREHENSIVE PLANNING
Application of Polyacrylamide to Pulp Mill Effluents (In Japanese),	Research in the Coastal and Oceanic Environ- ment. A Summary of Research Accomplished Under Project Themis,	Syracuse Metropolitan Area Comprehensive Plan-Water and Sewer Plan and Services Allo-
W74-04529 5D	W74-04732 2L	cation Plan,
Papermill Treatment Plant for Small Industry. W74-04534 5D	COBALT	W74-04507 5D
	Annual Consumption of Cesium-137 and	COMPRESSIBILITY
Process for Purifying Water that Contains Or- ganic Matter,	Cobalt-60 Labeled Pine Seeds by Small Mam- mals in an Oak-Hickory Forest,	Mechanical Properties of Frozen Ground Under High Pressure,
W74-04716 5D	W74-04450 5B	W74-04375 2C

COMPUTER MODELS	Practical Extensions to a Theory of Consolida-	CORN
Multipurpose Reservoirs and Urban Develop-	tion for Thawing Soils,	Effect of Light Intensity on the Quality and
ment,	W74-04384 2C	Feeding Effectiveness of Green Fodder, (In
W74-04319 6B	CONSTRUCTION	Russian), W74-04821 3F
Mathematical Modeling for Status Prediction	Engineering Design and Construction in Per-	W/4-04021 3F
and Control of Water Distribution Systems,	mafrost Regions: A Review,	CORN (FIELD)
W74-04320 4A	W74-04404 8D	A Study on the Depth of Basic Tillage and Soil
		Fertilization for Maize Grown Under Irrigation,
COMPUTER PROGRAMS	CONSTRUCTION COSTS	(In Bulgarian),
Complete Listing of Program Described in Op-	A Sewage-Treatment Concept for Permafrost	W74-04828 3F
timal Operation of Multi-Reservoir Water Resources Systems,	Areas,	Compositive Testing of Chart Term Wheet
W74-04315 4A	W74-04419 5D	Comparative Testing of Short-Term Wheat Monoculture, (In Bulgarian),
****	CONTINENTAL SHELF	W74-04831 3F
A Refraction Study and Program for Periodic	A Review of Oceanographic Variables and	W 74-04031
Waves Approaching a Shoreline, and Extend-	Their Analyses and Predictions Over the Con-	New Contributions to Biological Study of
ing Beyond the Breaking Point,	tinental Shelf,	Genetic Transmission of Resistance to Dryness
W74-04340 8B	W74-04329 2L	in Double Hybrids of Zea Mays,
A General Solution for the Two-Dimensional,		W74-04833 3F
Transient Heat Conduction Problem in Per-	Modification of Wave Spectra on the Continen-	CORROSION
mafrost, Using Implicit, Finite Difference	tal Shelf and in the Surf Zone,	Water Reuse and Deposits Control,
Methods,	W74-04762 2L	W74-04520 SD
W74-04350 2C	CONTROL SYSTEMS	W/4-04520
	Mathematical Modeling for Status Prediction	COST ANALYSIS
Flood Proofing Decisions Under Uncertainty:	and Control of Water Distribution Systems,	Study of Pulp and Paper Industry's Effluent
An Application to the Connecticut River Basin,	W74-04320 4A	Treatment.
W74-04463 6A		W74-04538 5D
A Numerical Classification of Selected Land-	CONVEYANCE STRUCTURES	
slides of the Debris Slide-Avalanche-Flow	Conduit Structure for Migrating Fish,	COST-BENEFIT ANALYSIS
Type,	W74-04715 8I	State-of-Art Review: Water Pollution Control
W74-04591 2J	4	Benefits and Costs, Vol I,
	Anti-Pollution Barge and Conveyer Assembly,	W74-04464 5G
A Numerical Model for Determining Integral	W74-04718 5G	Research Needs and Priorities: Water Pollution
Primary Production and Its Application to Lake	COOLING WATER	Control Benefits and Costs, Vol. II,
Michigan, W74-04786 5C	Heat - A Growing Water Pollution Problem,	W74-04465 5G
W/4-04/80	W74-04668 5B	
Identification of Bacteria by Computer: Theory		Allocation of Funding for Wastewater Treat-
and Programming,	COOLING WATER SYSTEMS	ment Facilities,
W74-04791 5A	Reviewing Environmental Impact Statements-	W74-04562 5D
COMPLICATION	Power Plant Cooling Systems, Engineering	Cost-Benefit Analysis of Irrigation Projects in
CONDUCTION A General Solution for the Two Dimensional	Aspects,	Northeastern Brazil,
A General Solution for the Two-Dimensional, Transient Heat Conduction Problem in Per-	W74-04555 5G	W74-04565 3F
mafrost, Using Implicit, Finite Difference	COPEPODA	
Methods,	Feeding of Juvenile Carp Cyprinus carpio L. in	COST COMPARISON
W74-04350 2C	the Arakum Bodies of Water (Delta of the	State-of-Art Review: Water Pollution Control
	Terek River) at Early Developmental Stages,	Benefits and Costs, Vol I,
CONDUITS	(In Russian),	W74-04464 5G
Conduit Structure for Migrating Fish,	W74-04649 2L	COST COMPARISONS
W74-04715 8I		Research Needs and Priorities: Water Pollution
CONFERENCES	COPPER	Control Benefits and Costs, Vol. II.
Permafrost: North American Contribution to	A Preliminary Survey of the Possible Con-	W74-04465 5G
Second International Conference.	tamination of Lake Nakuru in Kenya with	
W74-04346 2C	Some Metals and Chlorinated Hydrocarbon	COTTON
	Pesticides, W74-04547 5C	Role of Soil Conditions in the Development of
CONJUNCTIVE USE	W74-04547 5C	Moths, (In Russian),
A Design Procedure for the Conjunctive Use of	Effects of Cadmium and Copper on the Oxida-	W74-04640 3F
Surface and Groundwater Storages,	tion of Lactate by Rainbow Trout (Salmo gaird-	Drought Resistance of Radiation-Induced Mu-
W74-04598 4B	nert) Gills,	tant Varieties and Parent Forms of Cotton, (In
The Operation of a Stream-Aquifer System	W74-04780 5C	Russian),
Under Stochastic Demands,	222222222	W74-04822 3F
W74-04808 4B	COPPER IONS	•
	Effects of Toxicants on Brackish-Water	The Effect of Water Spraying on the Rein-
CONNECTICUT RIVER	Phytoplankton Assimilation,	Forcement of Physiological Process in Cotton
Flood Proofing Decisions Under Uncertainty:	W74-04644 5C	Plants,
An Application to the Connecticut River Basin,	CORE DRILLING	W74-04823 3F
W74-04463 6A	Investigation of Sampling Perennially Frozen	Water Consumption and Biological Coefficient
Papermill Treatment Plant for Small Industry.	Alluvial Gravel by Core Drilling,	of Furrow and Sprinkler Irrigated Cotton, (In
W74-04534 5D	W74-04402 2C	Bulgarian).
30		W74-04824 3F
CONSOLIDATION	CORIOLIS FORCE	
Thaw Consolidation of Alaskan Silts and	The Fallacy of Baer's Law or Coriolis' Effect	Results of Trials with Tobacco and Cotton
Granular Soils,	on the Meandering of Rivers,	Rotations Under Irrigation, (In Bulgarian),
W74-04379 2C	W74-04799 8B	W74-04825 3F

CREEP

CREEP	CULTURING VESSELS	Laboratory Applications of Radioisotopic
Evaluation of in Situ Creep Properties of	A Bacteriological Pressure-Retaining Deep-Sea	Tracers to Follow Beach Sediments,
Frozen Soils with the Pressuremeter,	Sampler and Culture Vessel,	W74-04751 2J
W74-04377 2C	W74-04773 5A	Some Characteristics of the Dutch Coast,
CROP PRODUCTION	CULVERTS	W74-04754 2J
Productivity and Grain Qualities of Certain	Control of Culvert Icing,	W14-04154 23
Newly Developed Native and Foreign Wheat	W74-04411 4C	Wave Interaction and Langmuir Circulations,
Varieties Grown Under Irrigation, (In Bulgari-		W74-04844 2H
an),	CURRENTS (WATER)	
W74-04832 3F	Growth of Longshore Currents Downstream of	A Field Study of Langmuir Circulations,
	a Surf-Zone Barrier,	W74-04845 2H
CROP ROTATION	W74-04324 2J	CYANIDES
Results of Trials with Tobacco and Cotton	Mixing Processes,	Hydrogen Peroxide for Industrial Pollution
Rotations Under Irrigation, (In Bulgarian),	W74-04327 5B	Control.
W74-04825 3F	W/4-0432/	W74-04532 5D
Companying Testing of Short Torm Wheet	Littoral Transport in the Great Lakes,	11770002
Comparative Testing of Short-Term Wheat	W74-04334 2J	Effects of Toxicants on Brackish-Water
Monoculture, (In Bulgarian), W74-04831 3F		Phytoplankton Assimilation,
W/4-04031	Modification of Nearshore Currents by Coastal	W74-04644 5C
CROP SELECTION	Structures,	
Cost-Benefit Analysis of Irrigation Projects in	W74-04341 8B	CYANOPHYCEA
Northeastern Brazil.	Currents at Harbor Beach, Michigan,	Comparative Study, in 1966 and 1967, of Three
W74-04565 3F	W74-04342 5B	Reservoirs in the Project of a Natural Park in
	W/4-04342 3B	the Morvan Region (In French),
CROPS RESISTANCE (DRYNESS)	Estuarine Currents and Tidal Streams,	W74-04815 5C
New Contributions to Biological Study of	W74-04344 2L	СУАПОРНУТА
Genetic Transmission of Resistance to Dryness		Concerning Large-Scale Cultivation of Thermo-
in Double Hybrids of Zea Mays,	Dynamics and Morphology of Sea Coasts.	philic Cosmopolitan Mastigocladus Laminousus
W74-04833 3F	W74-04425 2J	Cohn (Cyanophyta) in Icelandic Hot Springs,
	Limit Diff or Francisco of Warren and Ore	W74-04486 2I
CROPS YIELD	Littoral Drift as Function of Waves and Cur-	11 /1-01-150
Effect of Fertilizers and Irrigation Conditions	rent, W74-04623 2J	Calculation of the Concentration of the
on Yield, Chemical Composition, Baking Quali-	W/4-04025	Biomass of Blue-Green Algae During Settling,
ties of Winter Wheat Grain of Bezostaya 1 Cul-	Hydraulic Model Experiment on the Duffusion	(In Russian),
tivar, (In Russian),	Due to the Coastal Current,	W74-04645 5C
W74-04830 3F	W74-04628 5B	
CRUCIANS (SIBERIAN)		Phytoplankton Dynamics in the Severskiy
Sex Cycle, Spawning and Fertility of West	Use of a Computational Model for Two-Dimen-	Donets River for the First Years After its
Siberian Crucians in the Steppe Lakes, (In Rus-	sional Tidal Flow,	Regulation, (In Russina),
sian),	W74-04631 2L	W74-04648 5C
W74-04689 2H	Shore Transport. Formation of Sand Spits and	A Possible Explanation for the Differences in
	Tombolos,	the Fatty Acid Composition of Fresh-Water
CRUSTING (SOILS)	W74-04722 2J	and Marine Fishes,
Soil Crusting Related to Sprinkler Intensity,	-	W74-04688 5C
W74-04560 3F	Reproduction of Estuarine Structure and Cur-	
annet a an	rent Observation Techniques in the Hecate	CYCLING NUTRIENTS
CRYOLOGY	Model,	Movements of Phosphorus Between its Biologi-
Shock-Wave Studies of Ice and Two Frozen	W74-04724 2L	cally Important Forms in Lake Water,
Soils,	Calcuted Bibliography on Booch Factures and	W74-04783 5B
W74-04378 2C	Selected Bibliography on Beach Features and Related Nearshore Processes.	m m
An Analytical Study of a Coiled-Pipe Heat	W74-04728 2J	The Transport of Organic Carbon to Organisms
Sink,	W/4-04/20	Living in the Deep Oceans,
W74-04589 8B	An Annotated Bibliography of Flushing and	W74-04790 5C
54507 8B	Dispersion in Tidal Waters,	CYTOMEGALOVIRUSES
CRYSTAL GROWTH	W74-04731 2L	Relative Efficiency of Cell Cultures for Detec-
Experimental Pressure Studies on Frost Heave		tion of Viruses,
Mechanisms and the Growth-Fusion Behavior	Research in the Coastal and Oceanic Environ-	W74-04767 5A
of Ice,	ment. A Summary of Research Accomplished	
W74-04385 2C	Under Project Themis,	CZECHOSLOVAKIA (LIPINO RESERVOIR)
	W74-04732 2L	Relation Between the Amount of Net
CTENOPHARYNGODON-IDELLA	Rhomboid Ripple Mark, Indicator of Current	Zooplankton and the Depth of Station in Shal-
Parasite Fauna of Ctenopharyngodon idella	Direction and Environment,	low Lipno Reservoir,
from Pond- and Spawning-Nursery Fisheries in	W74-04739 2J	W74-04680 5C
the Volga Delta, (In Russian),		CZECHOSI OVAVIA (I INVO BECERVOTE
W74-04702 8I	Flume Experiments on Sand Transport by	CZECHOSLOVAKIA (LIPNO RESERVOIR)
CULTURES	Waves and Currents,	Horizontal Distribution of Some Chemical and
Relative Efficiency of Cell Cultures for Detec-	W74-04746 2L	Physical Characteristics in Lipno Reservoir, W74-04814
tion of Viruses.	Langebore Currents in One and Mattin	W74-04814 5C
W74-04767 5A	Longshore Currents in One and Multi-Bar	DAILY DIET
JA	Profiles Relation to Littoral Drift, W74-04749 2L	Daily Diet and Rate of Feeding of Notothenia
The Direct Enumeration of Escherichia coli in	W74-04749 2L	rossi marmorata Fischer and Dissostichus elegi-
Water Using Macconkey's Agar at 44 C in	Rhythmic Pattern of Longshore Bars Related to	noides Smitt, Family Notothenidae, in the Area
Plastic Pouches,	Sediment Characteristics,	of Southern Georgia (USSR), (In Russian),
W74-04768 5A	W74-04750 2J	W74-04679 2I

DALLAS (TEX) Effects of Urbanization on Floods in the Dal-	Control of Permafrost Degradation Beneath a Roadway by Subgrade Insulation,	Economic Power from Geothermal Heat, W74-04766 4B
las, Texas, Metropolitan Area,	W74-04409 4C	Suspended and Bedload Sediment Transport in
W74-04483 4C	Slone Development on a Mississippi Piver	the Snake and Clearwater Rivers in the Vicinity
DAM DESIGN	Slope Development on a Mississippi River Bluff in Historic Time,	of Lewiston, Idaho,
Thermal Regime in an Arctic Earthfill Dam,	W74-04585 2J	W74-04846 2J
W74-04410 8D		PROJECT CHOPLE
A - being of the Proposed Little Chang Bires	DEICERS	Approaches to Stormwater Management,
Analysis of the Proposed Little Chena River, Earthfilled Nonretention Dam, Fairbanks,	Control of Culvert Icing,	W74-04458 5A
Alaska,	W74-04411 4C	W 74-04-30
W74-04412 8D	DELAWARE	DESNA RIVER BED
	A Refraction Study and Program for Periodic	Effect of the Forest on the Displacement of the
DAMS	Waves Approaching a Shoreline, and Extend-	Desna River Bed and the Significance of this Effect on Forest Planting in the Floodplain, (In
Thermal Regime in an Arctic Earthfill Dam, W74-04410 8D	ing Beyond the Breaking Point,	Russian),
W/4-04410	W74-04340 8B	W74-04641 4A
Analysis of the Proposed Little Chena River,	DELTAS	
Earthfilled Nonretention Dam, Fairbanks,	Some Results of Regional Coastal Investiga-	DETECTION RESERVOIRS
Alaska,	tions in the USSR,	Approaches to Stormwater Management, W74-04458 5A
W74-04412 8D	W74-04426 2J	W74-04458 5A
DARCY'S LAW	History of the Formation of the Coasts of	DETRITUS
Studies on the Validity of Darcy's Law for	Kara-Bogaz-Gol,	Distribution and Uptake of Artificially In-
Flow in Natural Sands,	W74-04427 2J	troduced Radium-226 in a Small Lake,
W74-04307 2F		W74-04785 SF
DARTERS	DEMINERALIZATION	DEVELOPING COUNTRIES
Hybridization Between the Darters Percina	Water Cleaning Treatment,	Land Value Increments as a Measure of the
crassa roanoka and Percina oxyrhyncha	W74-04710 3A	Net Benefits of Urban Water Supply Projects
(Percidae, Etheostomatini), with Comments on	DENSITY	in Developing Countries: Theory and Measure
the Distribution of Percina crassa roanoka in	Viscosity Measurements of Water in Region of	ment,
New River,	Its Maximum Density,	W74-04502 6F
W74-04472 2E	W74-04518 2K	DEVON ISLAND (CANADA)
DATA COLLECTIONS	Comments on Managini Pages 10a Proportion	Accumulation on the Devon Island Ice Cap
Groundwater Investigation and Management in	Comments on Veronis' Paper, 'On Properties of Seawater Defined by Temperature, Salinity,	Northwest Territories, Canada,
Iran,	and Pressure',	W74-04325 20
W74-04569 7B	W74-04658 2K	DEIN AMERICA
Ground Water Date for Harris County Toron		DEWATERING Gravity Dewatering: Application to Paper Mil
Ground-Water Data for Harris County, Texas: Volume I. Drillers' Logs of Wells, 1905-71.	DENSITY CURRENTS	Wastes.
W74-04602 4B	Estuarine Currents and Tidal Streams,	W74-04533 5I
	W74-04344 2L	
Water Quality Records for the Hubbard Creek	DEPOSITION (SEDIMENTS)	DIFFUSION
Watershed, Texas, October 1969-September 1972,	Some Data on the Post-Glacial Evolution of	Multi-Dimensional Aspects of Eddy Diffusion Determined by Dye Diffusion Experiments in
W74-04606 5B	Karkinit Bay and the Accumulation of Bottom	Coastal Waters (Summary),
77-01000	Sediments Within it,	W74-04322 21
Hydrologic Data for Small Rural Catchments in	W74-04429 2J	
Australia, 1973,	Some Data on the Post-Glacial Transgression	A Study of Diffusion in an Estuary,
W74-04842 2E	of the Bering Sea,	W74-04333 51
DATA INTERPRETATION	W74-04431 2J	Simulation of Horizontal Turbulent Diffusion
Hydrocarbon and Chlorophyll: A Correlation in		of Particles Under Waves,
the Upwelling Region off West Africa,	DESALINATION	W74-04624 2
W74-04771 5B	Solar Distillation Apparatus,	PATRICIA DE L'ARRAY
DATA STORAGE AND RETRIEVAL	W74-04720 3A	Measurement of Moisture Diffusivity of We
An Inexpensive S.T.D. Data Logging System,	DESERTIFICATION	Swelling Systems,
W74-04772 7C	World Desertification: Cause and Effect. A	W74-04493 20
	Literature Review and Annotated Bibliography,	
DEBRIS AVALANCHES	W74-04461 3B	DIPTERA
A Numerical Classification of Selected Land-	DESERTS	Chironomidae (Diptera) from the Area of
slides of the Debris Slide-Avalanche-Flow	World Desertification: Cause and Effect. A	Freiburg in Breisgau (with Special Consideration of the Genus Chironomus), (In German),
Type, W74-04591 2J	Literature Review and Annotated Bibliography,	W74-04678 21
W1404571	W74-04461 3B	
DECISION MAKING	PROTON	DIRECT ENUMERATION
Flood Proofing Decisions Under Uncertainty:	DESIGN Engineering Design and Construction in Per-	The Direct Enumeration of Escherichia coli i
An Application to the Connecticut River Basin,	Engineering Design and Construction in Per- mafrost Regions: A Review,	Water Using Macconkey's Agar at 44 C i
W74-04463 6A	W74-04404 8D	Plastic Pouches, W74-04768 5.
DEEP SEA SAMPLER		11/4-01/00
A Bacteriological Pressure-Retaining Deep-Sea	DESIGN CRITERIA	DISCHARGE (WATER)
Sampler and Culture Vessel,	Laboratory Experiments to Determine the	Hydraulic Performance of BridgesExcava
W74-04773 5A	Structural Response of a Vertical Pile Sub-	tions at Bridges,
DEGRADATION (SLOPE)	jected to Wind-Generated Water Waves, W74-04424 8B	W74-04482
Rates of Mass Wasting in the Ruby Range,	11 / 1-04424 8B	Paleohydrology and Sedimentology of Lak
Yukon Territory,	The Atlantic Coast of Long Island,	Missoula Flooding in Eastern Washington,
W74-04371 2J	W74-04626 8A	W74-04599 2

DISCHARGE (WATER)

The Application of Numerical Simulation	DISTRIBUTION	DRILLING FLUIDS
Models in the Assessment of the Effect of	Distribution of Organic Matter and Bacteria in	Investigation of Sampling Perennially Frozen
Discharges into Coastal Waters,	the Upper Layer of Bottom Deposit of Lake	Alluvial Gravel by Core Drilling,
W74-04674 5B	Balaton, W74-04839 5B	W74-04402 2C
The Calculation of Critical Discharge Velocity	W74-04839 5B	DROUGHT
of Streams in Uniform Flow and the Trans-	DISTRIBUTION PATTERNS	Drought and Supplementary Feeding of Sheep
ported Sediment Size,	The Preferred Temperature of Fish and Their	in the Karoo,
W74-04800 2J	Midsummer Distribution in Temperate Lakes	W74-04834 3F
The Problem of Critical Discharge in Sediment	and Streams, W74-04666 5C	DROUGHT RESISTANCE
Motion.	W 74-04000	Changes in Enzymes in the Plant as Related to
W74-04801 2J	Mercury Uptake and Ion Distribution in Gills	Water Supply and Usage,
	of Rainbow Trout (Salmo gairdneri): Tissue	W74-04306 2I
DISINFECTION	Scans with an Electron Microprobe,	Drought Resistance of Radiation-Induced Mu-
Lime Disinfection of Sewage Bacteria at Low Temperature.	W74-04778 5A	tant Varieties and Parent Forms of Cotton, (In
W74-04548 5D	The Transport of Organic Carbon to Organisms	Russian),
30	Living in the Deep Oceans,	W74-04822 3F
Hypochlorination of Polluted Storm-Water	W74-04790 5C	DROUGHTS
Pumpage at New Orleans,	Types of Distribution Pattern Among Fresh-	World Desertification: Cause and Effect. A
W74-04676 5D	water Animals, (In Rumanian),	Literature Review and Annotated Bibliography,
DISPARITIES	W74-04840 2I	W74-04461 3B
Syracuse Metropolitan Area Comprehensive		
Plan-Water and Sewer Plan and Services Allo-	DISTRIBUTION (VERTICAL)	DUNES
cation Plan,	Vertical Distribution of Zoobenthos of the	The Role of Eolian Processes in the Dynamics of a Shallow Accumulation Coast.
W74-04507 5D	Mountain River of Adzhar ASSR (In Russian),	W74-04440 2J
DISPERSION	W74-04818 2I	
A Study of Diffusion in an Estuary,	DISTRICT OF COLUMBIA	Eolian Cross-Bedding in the Beach Dune En-
W74-04333 5B	An Assessment of the Use of Potomac Estuary	vironment, Sapelo Island, Georgia,
36	Waters and AWT Effluents for Emergency	W74-04737 2J
An Annotated Bibliography of Flushing and	Water Supply,	Development and Geologic Significance of Soft
Dispersion in Tidal Waters,	W74-04506 5D	Beach Sand,
W74-04731 2L	Evaluation of the Use of Pricing as a Tool for	W74-04757 2J
DISSOLVED GASES	Conserving Water,	DYE DISPERSION
Apparatus for Treating Waste Fluids by Means	W74-04810 3D	Multi-Dimensional Aspects of Eddy Diffusion
of Dissolved Gases,	PHIEROION	Determined by Dye Diffusion Experiments in
W74-04719 5D	DIVERSION Nutrient Income Change Related to Plankton	Coastal Waters (Summary),
DISCOLUED INODGANIS GARBON	Algae,	W74-04322 2L
DISSOLVED INORGANIC CARBON A Syringe Gas-Stripping Procedure for Gas-	W74-04318 5C	DYNAMIC PROGRAMMING
Chromatographic Determination of Dissolved		Optimal Operation of Multi-Reservoir Water
Inorganic and Organic Carbon in Fresh Water	DOMESTIC WASTES	Resources Systems,
and Carbonates in Sediments,	Apparatus for Treating Industrial and Domestic	W74-04314 4A
W74-04788 5A	Waste Waters, W74-04707 5D	Complete Mission of Process Process Asia Com
DISSOLVED ORGANIC CARBON	35	Complete Listing of Program Described in Op- timal Operation of Multi-Reservoir Water
A Syringe Gas-Stripping Procedure for Gas-	DRAINAGE	Resources Systems,
Chromatographic Determination of Dissolved	Control of Culvert Icing,	W74-04315 4A
Inorganic and Organic Carbon in Fresh Water	W74-04411 4C	
and Carbonates in Sediments,	Death of the Marshes in the Ardennes,	Application of Dynamic Programming in Mar-
W74-04788 5A	W74-04686 4A	kov Chains to the Evaluation of Water Quality in Irrigation,
DISSOLVED OXYGEN		W74-04561 3C
Water Quality Requirements of Aquatic In-	A Study on the Accuracy of Runoff Analysis	
sects,	for Pumping Drainage in Paddy Field Area (In	A Design Procedure for the Conjunctive Use of
W74-04551 5C	Japanese), W74-04811 4A	Surface and Groundwater Storages, W74-04598 4B
	W/101011	W74-04598 4B
Effects of Backpumping from South New	Effects of Flooding and Draining and Their Al-	E
River Canal at Pump Station S-9 on Quality of	ternation on the Growth and Uptake of	The Direct Enumeration of Escherichia coli in
Water in Water-Conservation Area 3, Broward County, Florida,	Nutrients by Rice (Oryza Sativa L., Indica Var. IR-8).	Water Using Macconkey's Agar at 44 C in
W74-04600 5B	W74-04826 3F	Plastic Pouches, W74-04768
	TV 1020	W74-04768 5A
DISSOLVED PHOSPHORUS	DRAINAGE SYSTEMS	EARTH DAMS
Movements of Phosphorus Between its Biologi-	Topology of River Systems and Hydrographic	Thermal Regime in an Arctic Earthfill Dam,
cally Important Forms in Lake Water, W74-04783 5B	Indicator Studies (Topologiya rechnykh sistem	W74-04410 8D
3B	i gidrograficheskiye indikatsionnyye iss- ledovaniya),	EARTHQUAKES
DISSOSTICHUS-ELEGINOIDES	W74-04578 2A	Prediction of the 1972 Managua, Nicaragua,
Daily Diet and Rate of Feeding of Notothenia		Earthquake from Groundwater Changes, In-
rossi marmorata Fischer and Dissostichus elegi-	DRILLERS LOGS	ferred Probability of Earthquakes in the City of
noides Smitt, Family Notothenidae, in the Area	Ground-Water Data for Harris County, Texas:	Managua, Nicaragua, during the Summer of
of Southern Georgia (USSR), (In Russian), W74-04679	Volume I. Drillers' Logs of Wells, 1905-71. W74-04602 4B	1973, W74-04467 2F
21	W74-04602 4B	W74-04467 2F

Without Street Color Circle Distribution of Plutonium in Liquid Waterbed, 1940-866 5 5	Waves Generated by Horizontal Motion of a	ELECTRICAL CONDUCTANCE	ENTRAINMENT
Second content 1972 1972 1972 1973 1974		Water Quality Records for the Hubbard Creek	Convective Heat Transfer to Water Containing
ECOLGICAL DISTRIBUTION ECODISTRIBUTION of Plutonium in Liquid Waste Disposal Areas at Los Alamos, Vir4-04400 SB ECOLGCY ECOLGC	W74-04760 8B		
ECOLOGY ECO-distribution of Plutonium in Liquid Wate Exposularions at Lors Alamos, w74-04449 Secolaribution of Plutonium in Liquid Wate Exposularions of Plutonium in Liquid Water Water Quality (Part of Pagic Plutonium in Liquid Water Water) (Pagic Plutonium in Liquid Water) (Pagic Plu	ECOLOGICAL DISTRIBUTION		
Disposal Areas at Los Alamos, W14-04449 59 ECOLOGY EC		W/4-04000 3B	W /4-04004 8B
ECOLOGY Ecodistribution of Plutonium in Liquid Water bispoonal Areas at Los Alamon. 5 Bischemical Ecology of Water Pollution, W74-04473 Sc. Electrolysis as a Purification Method for Electrolysis (as Speak) (Southeast Pampasic Revertypical Region (Southeast Pampasic Revertypical Revertypical Region (Southeast Pampasic Revertypical Revertypical Region		ELECTRICAL STUDIES	ENVIRONMENTAL CONTROL
ECOLOGY Ecodistribution of Plutonium in Liquid Waste Disposal Areas at Los Alamos, 74/40443 Bicchemical Ecology of Water Pollution, 74/40443 Bicchemical Ecology of Water Pollution, 74/40443 Scotial Economical Geology of Lagunas or Lakes of Third Order of the Temperate Recipion of Agentinal, 16 Spanish), 25 Economic Inspired Company of the Pulp and Paper Industry's Effuent Treatment. W74-04538 Sudy of Pulp and Paper Industry's Effuent Treatment. W74-04538 ECONOMITICS Sudy of Pulp and Paper Industry's Effuent Treatment. W74-04538 ECONOMITICS Sudy of Pulp and Paper Industry's Effuent Treatment. W74-04538 ECONOMIC EFFICIENCY Social, Economic, Environmental, and Technical Management Prova in Semiand Agricular A			Social, Economic, Environmental, and Techni-
Electric Cloud and Weather Modification with Disposal Areas at Los Alamos, W74-04433 ECONOMETRICS Study of Pulp and Paper Industry's Effluent Treatment. W74-04538 ECONOMIC EFFCIENCY Social, Economic, Environmental, and Technical Factors Influencing Water Resources and Replacement Flows in Semiand Agricultural Areas, W74-04537 ECONOMIC FRASIBILITY ECONOMIC FRASIBILITY ECONOMIC FRASIBILITY ECONOMIC FRASIBILITY ECONOMIC Samples of Water Pollution Control on Property Values, W74-04539 ECONOMIC Samples of Water Pollution of Platonism in Liquid Waste Disposal Areas at Los Alamos. ECONOMIC Samples of Ground Water Resources and Replacement Flows in Semiand Agricultural Areas, W74-04539 ECONOMIC FRASIBILITY ECONOMIC Samples of Ground Water Resources and Replacement Flows in Semiand Agricultural Areas, W74-04539 ECONOMIC FRASIBILITY ECONOMIC Samples of Ground Water Resources and Replacement Flows in Semiand Agricultural Areas, W74-04539 ECONOMIC Samples of Ground Water Resources and Replacement Flows in Semiand Agricultural Areas, W74-04539 ECONOMIC Samples of Ground Water Resources and Replacement Flows in Semiand Agricultural Areas, W74-04539 ECONOMIC Samples of Ground Water Resources and Replacement Flows in Semiand Agricultural Areas, W74-04539 ECONOMIC Samples of Ground Water Resources and Replacement Flows in Semiand Agricultural Areas, W74-04539 ECONOMIC Samples of Ground Water Resources and Replacement Flows in Semiand Agricultural Areas, W74-04539 ECONOMIC Samples of Ground Water Resources and Replacement Flows in Semiand Agricultural Areas, W74-04539 ECONOMIC Samples of Ground Water Resources and Replacement Flows in Semiand Agricultural Areas, W74-04539 ECONOMIC Samples of Ground Water Resources and Replacement Flows in Semiand Agricultural Areas, W74-04539 ECONOMIC Samples of Ground Water Resources and Replacement Flows in Semiand Agricultural Areas, W74-04539 ECONOMIC Samples of Ground Water Resources and Replacement Flows in Semiand Agricultural Areas, W74-04539 ECONOMIC Samples of Ground		W74-04400 2C	
ECONOMIC EFFICIENCY W74-0453 Biochemical Ecology of Water Pollution, W74-04523 Ecology and Biocenology of Lagunas or Lakes of Third Order of the Temperate Pollution of Argentina), (in Spanish). W74-0457 ECONOMIC FEGURA WATER Pollution of Part Industry's Effluent of the Pulp and Paper Industry's Effluent W74-04520 ELECTRON REAMS Electronic Sulvey of Pulp and Paper Industry's Effluent Treatment. W74-0453 ECONOMIC EFFICIENCY ECONOMIC EFFICIENCY ECONOMIC FEASIBILITY		Electric Cloud and Weather Modification with	W74-04317 5D
### W74-0460 ### Biochemical Ecology of Water Pollution, W74-0460 ### Electroly says a Purification Method for EL. W74-0460 ### Purification Method for EL. W74-0460 ### Electroly says a Purification Method for EL. W74-0460 ### Electroly says a Purification Method for EL. W74-0460 ### Electroly says a Purification Method for EL. W74-0460 ### Electroly says a Purification Method for EL. W74-0460 ### Electroly says a Purification Method for EL. W74-0460 ### Electroly says a Purification Method for EL. W74-0460 ### Electroly says a Purification Method for EL. W74-0460 ### Electroly says a Purification Method for EL. W74-0460 ### Electroly says a Purification Method for EL. W74-0460 ### Electroly says a Purification Method for EL. W74-0460 ### Electroly says a Purification Method for EL. W74-0460 ### Electroly says a Purification Method for EL. W74-0460 ### Electroly says a Purification Method for EL. W74-0460 ### Electroly says a Purification Method for EL. W74-0460 ### Electroly says a Purification Method for EL. W74-0460 ### Electroly says a Purification Wethod for EL. W74-0460 ### Electroly says a Purification Method for EL. W74-0460 ### Electroly says a Purification Method for EL. W74-0460 ### Electroly says a Purification Method for EL. W74-0460 ### Electroly says a Purification Wethod for EL. W74-0460 ### Electroly says a Purification Wethod for EL. W74-0460 ### Electroly says a Purification Wethod for EL. W74-0460 ### Electroly says a Purification Wethod for EL. W74-0460 ### Electroly says a Purification Wethod for EL. W74-0460 ### Electroly says a Purification Wethod for EL. W74-0460 ### Electroly says a Purification Wethod for EL. W74-0460 ### Electroly says a Purification Wethod for EL. W74-0460 ### Electroly says a Purification Wethod for EL. W74-0460 ### Electroly says a Purification Wethod for EL. W74-0460 ### Electroly says a Purification Wethod for EL. W74-0460 ### Electroly says a Purification Wethod for El. W74-0460 ### Electroly says a Purification Wethod for El.			ENVIRONMENTAL EFFECTS
Biochemical Ecology of Water Follution, W74-04573 Ecology and Bioceomology of Lagunas or Lakes of Third Order of the Temperate Recipion of Argentina), (In Spanish), W74-0457 Ecology and Bioceomology of Lagunas or Lakes of Third Order of the Temperate Recipion of Argentina), (In Spanish), W74-0457 Ecology and Bioceomology of Lagunas or Lakes of Third Order of the Temperate Recipion of Argentina), (In Spanish), W74-0457 Ecology and Bioceomology of Lagunas or Lakes of Third Order of the Temperate Recipion of Argentina), (In Spanish), W74-0457 Economic Agents of Ground Water Resources and Replacement Flows in Semiard Agricultural Areas, W74-04517 Economic Aspects of Ground Water Resources and Replacement Flows in Semiard Agricultural Areas, W74-04503 BECONOMICS ECONOMICS ECONO			
Biochemical Ecology of Water Pollution, W74-04523 SC Ecology and Biocenology of Lagunas or Lakes of Third Order of the Temperate Name of Third Order of Third	W/4-04443 3B		
Ecology and Biocoenology of Lagunas or Lakes of Third Order of the Temperate Nectoropical Region (Southeast Pampasie Rebettropical Report Rebettropical Region (Southeast Pampasie Rebettropical Report R	Biochemical Ecology of Water Pollution,		
Ecology and Biocenology of Lagunas or Lakes of Third Order of the Temperate Neotropical Region (Southeast Panpaise Region of Argentina), (In Spanish), W74-04577 211 ECONOMETRICS Study of Puly and Paper Industry's Effluent Treatment. W74-0458 5D ECONOMIC SPRICENCY Study of Puly and Paper Industry's Effluent Treatment. W74-04517 5D ECONOMIC SPRICENCY Study of Puly and Paper Industry's Effluent Treatment. W74-04518 5D ECONOMIC SPRICENCY Study of Puly and Paper Industry's Effluent Treatment. W74-04517 5D ECONOMIC SPRICENCY Study of Puly and Paper Industry's Effluent Treatment. W74-04518 5D ECONOMIC SPRICENCY Study of Puly and Paper Industry's Effluent Treatment. W74-04519 5D ECONOMIC SPRICENCY Scanial Economic Aspects of Ground Water Resurces and Replacement Flows in Semiarid Agricultural Areas, W74-04538 4B ECONOMICS ERECTRON MICROSCOPY Scaning Electron Microscopy of Fixed, Frozen, and Dried Protozoon. W74-04538 4B ECONOMICS ERECTRON MICROSCOPY Scaning Electron Microscopy of Fixed, Frozen, and Dried Protozoon. W74-04539 5G Application of Dynamic Programming in Markov Chains to the Evaluation of Water Quality Infragation. W74-04559 5G Application of Dynamic Programming in Markov Chains to the Evaluation of Water Quality Infragation. W74-04459 5C ECONOMICS ECONOMICS ERECTRON MICROSCOPY Scaning Electron Microscopy of Fixed, Frozen, and Dried Protozoon. W74-04559 5G Application of Dynamic Programming in Markov Chains to the Evaluation of Water Quality Infragation. W74-04559 5G Application of Dynamic Programming in Markov Chains to the Evaluation of Water Quality Infragation. W74-04559 5G Application of Dynamic Programming in Markov Chains to the Evaluation of Water Quality Order Account of the Markov Chains to the Evaluation of Water Quality Order Chains to the Evaluation of Water Quality Order Chains Cooling Systems, Engineering Prover Plant Cooling Sy	The state of the s		-
waeser der Papier- und Zellstoffindustrie), Ward-6452 Sudy of Pulp and Paper Industry's Effluent Perapark Ward-6453 Papier Sudy of Pulp and Paper Industry's Effluent Perapark Ward-6453 Papier Perapark Ward-6453 Papier Perapark P			
Nectorpical Region (Southeast Pampasis Region of Argentina), (in Spanish). With Mary 2 ECONOMETRICS Study of Pulp and Paper Industry's Efftuent Treatment. With Mary 3 ECONOMIC FEFICIENCY Social, Economic, Environmental, and Technical Factors Influencing Water Reuse, Spanish Report of Coronal Agrection of Protein Processes and Replacement Flows in Semiarid Agricultural Areas, With Mary 404538 ECONOMIC FEFICIENCY Social, Economic, Environmental, and Technical Factors Influencing Water Reuse, Spanish Report of Coronal Agrects of Ground Water Resources and Replacement Flows in Semiarid Agricultural Areas, With Mary 404538 ECONOMIC FEASIBILITY ECONOMIC FEASIBILITY ECONOMIC Seasible Coronal Water Resources and Replacement Flows in Semiarid Agricultural Areas, With Mary 404538 ECONOMICS Benefit of Water Pollution Control on Property Values, With Mary 404539 Application of Dynamic Programming in Markor Chains to the Evaluation of Water Quality Intrigation, Science of Property Advisors (With Mary 40453) CEOSYSTEMS ECONOMICS ECONOMICS ENDUCATION Terth Year Annual Report, Center for Research in Water Resources, University of Texas at Austin. Text Water Resources, University of Texas at Austin. With Addison Control on Property (With Yelds) ENERGY TRANSFER Harmonic Generation of Shallow Water Waves, Over Topography, With Addison of Wind Waves, With Addison (With Addison) EFFLUENTS Mixing Processes, With Addison (With Addison) EFFLUENTS Mixing Processes, With Addison (With Addison) ENTREMORATERIA Salmonella Serotypes in Sewage of Various Origins, and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, With Addison (With Addison) EFFLUENTS Mixing Processes, With Addison (With Addison) ENTREMORATERIA Salmonella Serotypes in Sewage of Various Origins, Engineering Agricultural Analysis (Clearing) Elastic Properties, With Addison (With Addison) ENTREMORATE SLOWER FRODUCTION Elastic Properties, With Addison (With Addison) ENTREMORATERIA Salmonella Serotypes in Sewage of Various Origi			
ECONOME FRICE Study of Pulp and Paper Industry's Effuent Treatment. W74-04538 ECONOMIC FERCIENCY Social, Economic, Environmental, and Technical Fectors Influencing Water Reuse, W74-04509 ECONOMIC FERSIBILITY ECONOMIC SABBELTY ECONOMIC FERSIBILITY ECONOMIC FERSIBILITY ECONOMIC FERSIBILITY ECONOMIC FERSIBILITY ECONOMIC FERSIBILITY ECONOMIC FERSIBILITY AND A PAPER AND A PAPER FOR A PROPERTY AND A PROP			
ECONOMETRICS Study of Pulp and Paper Industry's Effluent Treatment. W74-04509 Study of Pulp and Paper Industry's Effluent Treatment. ELECTRON BEAMS ELECTRON BEAMS ELECTRON MICROSCOPY Social, Economic, Environmental, and Technical Factors Influencing Water Reuse, W74-04604 ELECTRON MICROSCOPY Social, Economic, Environmental, and Technical Factors Influencing Water Reuse, W74-04604 ELECTRON MICROSCOPY Social, Economic, Environmental, and Technical Factors Influencing Water Reuse, W74-04604 ELECTRON MICROSCOPY Social, Economic, Environmental, and Technical Factors Influencing Water Reuse, W74-04604 ELECTRON MICROSCOPY Social, Economic, Environmental, and Technical Factors Influencing Water Reuse, W74-04505 ECONOMIC FEASIBILITY Economic Aspects of Ground Water Reuse, W74-04505 ECONOMICS ECONOMICS Benefit of Water Pollution Control on Property Values, W74-04505 ECONOMICS Benefit of Water Pollution Control on Property Values, W74-04505 GAPPIcacion of Dynamic Programming in Marbor Chains to the Evaluation of Water Quality in Irrigation, W74-04506 ECOSYSTEMS ECOGISTEMS ECOUSTION Tenth Year Annual Report, Center for Research in Water Resources, University of Texas at Austin. ENERGY TRANSFER Harmonic Generation of Shallow Water Waves, W74-04509 EFFLUENTS Mixing Processes, W74-04513 ENERGY TRANSFER Mixing Processes, W74-04509 EFFLUENTS Mixing Processes, W74-04513 ENERGY TRANSFER Mixing Process			W/4-04413 4C
ECONOMETRICS Study of Pulp and Paper Industry's Effluent Treatment. W74-04538 EDITION Social, Economic, Environmental, and Technical Ectric Cloud and Weather Modification with Intense Relativistic Electron Beams, W74-04538 ECONOMIC FERICIENCY Social, Economic, Environmental, and Technical Ectron Microscopy of Fixed, W74-04551 ECONOMIC FERSIBILITY ECONOMIC FEASIBILITY ECONOMIC FEASIBILITY ECONOMIC Samples of Ground Water Resources and Replacement Flows in Semiarid Agricultural Areas, W74-04563 4B ECONOMICS Benefit of Water Pollution Control on Property Values, W74-04559 ECONOMICS Benefit of Water Pollution Control on Property Values, W74-04559 ECONOMICS Benefit of Water Pollution of Dynamic Programming in Markov Chains to the Evaluation of Water Quality in Irrigation, W74-04561 3C ECOSSTEMS ECOLOGICAL State of Control on Property W74-04679 ECONOMICS ECOSSTEMS ECOLOGICAL State of Control on Property Values, W74-04439 EDUCATION Tenth Year Annual Report, Center for Research in Water Resources, University of Texas at Austin. W74-04439 EPIDICATION Tenth Year Annual Report, Center for Research in Water Resources, University of Texas at Austin. W74-04439 EFFLUENT STREAMS Sunce of Flow Establishment for Round Buoyant Jets, W74-04536 EFFLUENT STREAMS Sunce of Flow Establishment for Round Buoyant Jets, W74-04536 EFFLUENT STREAMS Sunce of Flow Establishment for Round Buoyant Jets, W74-04536 EFFLUENT STREAMS Sunce of Flow Establishment for Round Buoyant Jets, W74-04536 EFFLUENT STREAMS Sunce of Flow Establishment for Round Buoyant Jets, W74-04536 EFFLUENT SEEAMS Sunce of Flow Establishment for Round Buoyant Jets, W74-04536 EFFLUENT SEEAMS Sunce of Flow Establishment for Round Buoyant Jets, W74-04536 EFFLUENT Semiar and Dynamical Scales for Generation of Wind Waves, W74-04536 EFFLUENT SEEAMS Sunce of Flow Establishment for Round Buoyant Jets, W74-04536 EFFLUENT SEEAMS Sunce of Flow Establishment for Round Buoyant Jets, W74-04536 EFFLUENT SEEAMS Sunce of Flow Establishment for Round Buoyant Jets, W74-04536 EFFLUENT SEEAMS Sun			Managing Growth in a Fragile Environment:
Study of Pulp and Paper Industry's Effluent Treatment. W74-04538 5D ECONOMIC EFFICIENCY Social, Economic, Environmental, and Technical Factors Influencing Water Reuse. W74-04317 ECONOMIC FEASIBILITY Economic Aspects of Ground Water Resources and Replacement Flows in Semiarid Agricultural Areas, W74-0456 W74-0457 ECONOMIC SEASIBILITY Economic Aspects of Ground Water Resources and Replacement Flows in Semiarid Agricultural Areas, W74-0456 W74-04559 ECONOMICS Benefit of Water Pollution Control on Property Values, W74-04550 ECONOMICS Benefit of Water Pollution Control on Property Values, W74-04550 ECOSYSTEMS ECOSYSTE	W/4-0401/		Problems of the Rocky Mountain States,
Treatment. Treatment. Treatments. Statements. Treatments. Statements. Treatments. Treatments. Statements. Treatments. Statements. Statemen	ECONOMETRICS	W/4-04400 2C	W74-04505 6D
Treatment. W74-04538 5D ECONOMIC EFFICIENCY Social, Economic, Environmental, and Technical Factorial Ellectron Microscopy of Fixed, Frozen, and Dried Protozoa, W74-04517 5D ECONOMIC FEASIBILITY ECONOMIC FEASIBILITY ECONOMIC Seaming Electron Microscopy of Fixed, Frozen, and Dried Protozoa, W74-0457 7B ECONOMIC Seaming Electron Microscopy of Fixed, Frozen, and Dried Protozoa, W74-0457 7B ECONOMIC Seaming Electron Microscopy of Fixed, Frozen, and Dried Protozoa, W74-04579 7B ECONOMIC Seaming Electron Microscopy, Cling Statements Prower Plant Cooling Systems, Engineering Aspects, W74-04555 5G ENTERONIC GROWTH STAGE Temperature Requirements for Embryos and Larvae of the Northern Pike, Esox lucius (Linaneus), W74-04550 5G Application of Dynamic Programming in Markov Chains to the Evaluation of Water Quality in Irrigation, W74-04561 3C ECOSYSTEMS ECOSYSTEMS ECOSYSTEMS ECOSYSTEMS ECOSYSTEMS ECOLORITION Tenth Year Annual Report, Center for Research in Water Resources, University of Texas at Austin. W74-04530 5A W74-04579 5A EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyani Jets, W74-04570 5B EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyani Jets, W74-04570 5B EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyani Jets, W74-04570 5B EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyani Jets, W74-04570 5B EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyani Jets, W74-04570 5B EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyani Jets, W74-04570 5B EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyani Jets, W74-04570 5B EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyani Jets, W74-04570 5B EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyani Jets, W74-04570 5B EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyani Jets, W74-04570 5B EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyani Jets, W74-04570 5B EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyani Jets, W74-04570 5B EFFLUENT STREAMS Zone of Flow Establishment	Study of Pulp and Paper Industry's Effluent	ELECTRON BEAMS	
ECONOMIC EFFICIENCY Social, Economic, Environmental, and Technical Factors Influencing Water Reuse, W74-0457 ECONOMIC FEASIBILITY Economic Aspects of Ground Water Resources and Replacement Flows in Semiarid Agricultural Areas, W74-04563 ECONOMICS Benefit of Water Pollution Control on Property Values, W74-04559 ECONOMICS Benefit of Water Pollution Control on Property Values, W74-04559 Application of Dynamic Programming in Markov Chains to the Evaluation of Water Quality In Irrigation, W74-04561 ECOSYSTEMS ECOGSTEMS ECOSYSTEMS ECOGSTEMS ECOSYSTEMS ECOGSTEMS ECOSYSTEMS ECOGSTEMS ECOSYSTEMS ECOGSTEMS ECOSYSTEMS ECOLOTION Tenth Year Annual Report, Center for Research in Water Resources, University of Texas at Austin. W74-04595 EPFLUENT STREAMS Zone of Flow Establishment for Round Buoyand Jets, W74-04567 EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyand Jets, W74-04569 EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyand Jets, W74-04569 EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyand Jets, W74-04569 EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyand Jets, W74-04569 EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyand Jets, W74-04569 EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyand Jets, W74-04569 EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyand Jets, W74-04569 EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyand Jets, W74-04569 EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyand Jets, W74-04569 EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyand Jets, W74-04569 EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyand Jets, W74-04569 EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyand Jets, W74-04569 EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyand Jets, W74-04569 EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyand Jets, W74-04569 EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyand Jets, W74-04569 EFFLUENT STREAMS Zone of Flow Establishment	Treatment.		
SCONOMIC EFFICIENCY Social, Economic, Environmental, and Technical Factors Influencing Water Reuse, W74-04317 Social, Economic Aspects of Ground Water Resources and Dried Protozoa, W74-04497 Economic Aspects of Ground Water Resources and Replacement Flows in Semiarid Agricultural Areas, W74-04533 BECONOMICS Benefit of Water Pollution Control on Property Values, W74-04533 BECONOMICS Benefit of Water Pollution Control on Property Values, W74-04559 Septimate of the Northern Pike, Esox Incine (Linnaeus), W74-04550 Application of Dynamic Programming in Markov Chains to the Evaluation of Water Quality in Irrigation, W74-04561 SCOSYSTEMS ECOSYSTEMS ECOSYSTEMS ECOSYSTEMS ECOLOTION Tenth Year Annual Report, Center for Research in Water Resources, University of Texas at Austin. W74-04593 SPEPULENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, W74-0457 SEFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, W74-04567 SEELASTIC THEORY Lee Engineering—Summary of Elastic Properties Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-04580 ELIASTIC THEORY Lee Engineering—Summary of Elastic Properties Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-04560 ENTEROWATION Control, W74-0457 Specific Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-04560 ENTEROWATION Control, W74-0457 Specific Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-04580 ENTEROWATION Control, W74-0459 Specific Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-04580 ENTEROWATION Control, W74-0459 Specific Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-04580 ENTEROWATION Control, W74-0459 Specific Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-04580 ENTEROWATION Control, W74-0459 Specific Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-0459 Specific	W74-04538 5D	Intense Relativistic Electron Beams,	
Social, Economic, Environmental, and Technical Factors Influencing Water Reuse, 5 MY-404179 5D Social, Economic Aspects of Ground Water Resources and Replacement Flows in Semiarid Agricultural Areas, W7-404563 4B ECONOMICS Benefit of Water Pollution Control on Property Values, W7-404569 4B ECONOMICS Benefit of Water Pollution Control on Property Values, W7-404569 5G	POONOLING PROPERTY.	W74-04604 3B	
cal Factors Influencing Water Reuse, W74-04317 5D Frozen, and Dried Protozon, W74-044317 7B Frozen, and Dried Protozon, W74-044317 7B Frozen, and Dried Protozon, W74-04531 7B Frozen Frozen, and Dried Protozon, W74-04531 7B Frozen		FI POTRON MICROSCORY	11 14 04333
ECONOMIC FEASIBILITY Economic Aspects of Ground Water Resources and Replacement Flows in Semiarid Agricultural Areas, W74-04563 4B ECONOMICS Renefit of Water Pollution Control on Property Values, W74-04550 M74-04550 SG Application of Dynamic Programming in Markov Chains to the Evaluation of Water Quality In Irrigation, W74-04561 ECOSYSTEMS ECOSYSTEMS EDUCATION Tenth Year Annual Report, Center for Research in Water Resources, University of Texas at Austin. W274-04555 EDUCATION Tenth Year Annual Report, Center for Research in Water Resources, University of Texas at Austin. W274-04555 EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, W74-04567 EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, W74-04573 EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, W74-04573 EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, W74-04573 EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, W74-04573 EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, W74-04573 EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, W74-04573 EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, W74-04573 EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, W74-04573 EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, W74-04573 EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, W74-04573 EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, W74-04573 EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, W74-04573 EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, W74-04573 EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, W74-04573 EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, W74-04573 EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, W74-04573 EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, W74-04573 EFFLUENT STREAMS Zone of			ENVIRONMENTAL IMPACT STATEMENTS
ECONOMIC FEASIBILITY Economic Aspects of Ground Water Resources and Replacement Flows in Semiarid Agricultural Areas, which of Sementh Areas (Months of Semiarid Agricultural Areas) 4B ECONOMICS Benefit of Water Pollution Control on Property Values, (Months of Semiarid Agricultural Areas) 5G MY4-04559 5G Application of Dynamic Programming in Markov Chains to the Evaluation of Water Quality In Irrigation. WY4-04561 3C ECOSYSTEMS ECOGISTEMS ECOLICATION Tenth Year Annual Report, Center for Research in Water Resources, University of Texas at Austin. WY4-04579 9A EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, WY4-04579 5B EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, WY4-04579 5B EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, WY4-04579 5B EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, WY4-04579 5B EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, WY4-04579 5B EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, WY4-04579 5B EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, WY4-04579 5B EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, WY4-04579 5B EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, WY4-04579 5B EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, WY4-04579 5B EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, WY4-04579 5B EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, WY4-04579 5B EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, WY4-04579 5B EFFLUENTS ENTEROPHICE ROUNT No. Control, WY4-04579 5B EFFLUENTS ENTEROPHICE ROUNT NO. Control, WY4-04579 5B EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, WY4-04579 5B EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, WY4-04579 5B EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, WY4-04579 5B EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Lets, WY4-04579			
ECONOMIC FEASIBILITY Economic Aspects of Ground Water Resources and Replacement Flows in Semiarid Agricultural Areas, w74-04563 4B ECONOMICS Benefit of Water Pollution Control on Property Values, W74-04550 5G Application of Dynamic Programming in Marco of the Northern Pike, Esox lucius in Irrigation, W74-04550 3C Application of Dynamic Programming in Marco of the Northern Pike, Esox lucius in Irrigation, W74-04550 3C ECOSYSTEMS Ecodistribution of Plutonium in Liquid Waste Disposal Areas at Los Alamos, W74-04433 5B EDUCATION Tenth Year Annual Report, Center for Research in Water Resources, University of Texas at Austin. W74-04595 9A EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Jets, W74-04573 5B ELASTIC THEORY Lee Engineering-Summary of Elastic Properties Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-040793 2C ELECTRIC POWER PRODUCTION Economic Power from Geothermal Heat, Economic Power from Geothermal Heat, PAGETON MICROSCOPY, In Richards State, Survivological Requirements for Embryos and Larvae of the Northern Pike, Esox lucius (Inaneus), W74-04550 5C EMBRYONIC GROWTH STAGE EMBRYONIC GROWTH STAGE EMBRYONIC GROWTH STAGE EMBRYONIC GROWTH STAGE Temperature Requirements for Embryos and Larvae of the Northern Pike, Esox lucius (Inaneus), W74-04550 5C EMBRYONIC GROWTH STAGE Temperature Requirements for Embryos and Larvae of the Northern Pike, Esox lucius (Inaneus), W74-04560 5C ENDRANCERED SPECIES Death of the Marshes in the Ardennes, W74-04660 4A ENERGY SLOPE Share Velocity in a Tidal Estuary, W74-04590 2L ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04323 2E ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04333 2E ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04333 2E ENERGY TRANSFER Harmonic Generation of Shallow Water Polution, W74-04333 2E ENGRIC Harmonic Generation of Shallow Water Polution, W74-04333 5B ENGRIC Harmonic Generation of Shallow Water Polution	W/4-0431/		
ECONOMICS Benefit of Water Pollution Control on Property Values, W74-04550 4B ECONOMICS Benefit of Water Pollution Control on Property Values, W74-04550 5G Application of Dynamic Programming in Markov Chains to the Evaluation of Water Quality in Irrigation, W74-04561 3C ECOSYSTEMS ECOSYSTEMS ECOISTICHION OF Platonium in Liquid Waste Disposal Areas at Los Alamos, W74-04649 5B EDICATION Tenth Year Annual Report, Center for Research in Water Resources, University of Texas at Austin. W74-04595 9A EFFLUENTS STREAMS Zone of Flow Establishment for Round Buoyant Jets, W74-04513 5B EFFLUENTS Mixing Processes, W74-04327 5B ELASTIC THEORY Lee Engineering-Summary of Elastic Properties Research and Introduction to Viscoclastic and Nonlinear Analysis of Saline Ice, W74-04590 5B ELECTRIC POWER PRODUCTION Economic Power from Geothermal Heat, Research on Sewage, (In Russian), was proposed to the Control, W74-04590 5B ENERGY TRANSPER ENERGY SLOPE Shear velocity in a Tidal Estuary, W74-04500 5C ENDRANSER DEVELOPS Shear velocity in a Tidal Estuary, W74-04500 21 ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04523 2E ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04530 2E EFFLUENTS Mixing Processes, W74-04320 2E EFFLUENTS Mixing Processes, W74-04327 5B ELASTIC THEORY Lee Engineering-Summary of Elastic Properties Research and Introduction to Viscoclastic and Nonlinear Analysis of Saline Ice, W74-04590 5B ENTEROVIRUSES An Experiment in Sanitary-Virological Research on Sewage of Various Origins, W74-04590 5B ENTEROVIRUSES An Experiment in Sanitary-Virological Research on Sewage, (In Russian), W74-04591 properties Research on Sewage, (In Russian), W74-04590 SB ENTEROVIRUSES An Experiment in Sanitary-Virological Research on Sewage, (In Russian), W74-04590 SB	ECONOMIC FEASIBILITY		
Russian), W74-04503 4B ECONOMICS Benefit of Water Pollution Control on Property Values, W74-04550 5G Application of Dynamic Programming in Markov Chains to the Evaluation of Water Quality In Irrigation, W74-04561 3C ECOSYSTEMS ECOSYSTEMS ECOSYSTEMS ECOSYSTEMS DEDUCATION Tenth Year Annual Report, Center for Research in Water Resources, University of Texas at Austin. W74-04595 9A EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Jets, W74-04537 5B EFFLUENTS Mixing Processes, W74-04327 5B ELASTIC THEORY Ice Engineering-Summary of Elastic Properties Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-04793 2C ELECTRIC POWER PRODUCTION Economic Power from Geothermal Heat, ECONOMICS BERRYONIC GROWTH STAGE Temperature Requirements for Embryos and Larvae of the Northern Pike, Esox lucius (Linnaeus), W74-04670 5C Temperature Requirements for Embryos and Larvae of the Northern Pike, Esox lucius (Linnaeus), W74-04670 5C ENBRYONIC GROWTH STAGE Temperature Requirements for Embryos and Larvae of the Northern Pike, Esox lucius (Linnaeus), W74-04670 5C ENBRYONIC GROWTH STAGE Temperature Requirements for Embryos and Larvae of the Northern Pike, Esox lucius (Linnaeus), W74-04670 5C ENBRYONIC GROWTH STAGE Temperature Requirements for Embryos and Larvae of the Northern Pike, Esox lucius (Linnaeus), W74-04670 5C ENBRYONIC GROWTH STAGE Temperature Requirements for Embryos and Larvae of the Northern Pike, Esox lucius (Linnaeus), W74-04670 5C ENERGY SLOPE Death of the Marshes in the Ardennes, W74-04686 4A W74-04686 4A W74-04686 4A W74-04686 4A W74-04699 2L ENERGY SLOPE Shear Velocity in a Tidal Estuary, W74-04500 2L ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04500 2E ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04500 2E ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04500 2E ENGRY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04500 2E ENERGY TRANSFER H	Economic Aspects of Ground Water Resources		W74-04555 5G
tural Areas, W74-04563 4B W74-04558 5A BECONOMICS Benefit of Water Pollution Control on Property Values, W74-04550 5G Application of Dynamic Programming in Markov Chains to the Evaluation of Water Quality In Irrigation, W74-04561 3C ECOSYSTEMS ECOSYSTEMS ECOSYSTEMS EDUCATION Tenth Year Annual Report, Center for Research in Water Resources, University of Texas at Austin. W74-04595 9A EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Jets, W74-04532 5B EFFLUENTS Mixing Processes, W74-04327 5B ELASTIC THEORY Ice Engineering-Summary of Elastic Properties Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-04793 5B ELECTRIC POWER PRODUCTION Economic Power from Geothermal Heat, EMBRYONIC GROWTH STAGE Temperature Requirements for Embryos and Leave (Linnaeus), W74-04650 5C EMBRYONIC GROWTH STAGE Temperature Requirements for Embryos and Leave (Linnaeus), W74-04670 5C ENDANGERED SPECIES Death of the Marshes in the Ardennes, W74-046444 And Open Space Preservation Projects, W74-04649 2L ENERGY SLOPE Shear Velocity in a Tidal Estuary, W74-04590 5B ENERGY TRANSFER Harmonic Generation of Shallow Water Waves, W74-04590 2E ENTEROWIRONAL QUALITY Estimating the Benefits of Stream Valley and Open Space Preservation Projects, W47-04650 6B ENTEROSITE AND APPROVED TO BENEFITY AND APPROVE PROPUCTION Environment, Sapa, W74-04660 6B ENTEROSITE AND APPROVE PROPUCTION Environmental Chemistry: Air and Water Pollution, W74-04530 5B ENTEROVIRUSES An Experiment in Sanitary-Virological Requirements for Embryos and Leave (Volta Arthous Christian	and Replacement Flows in Semiarid Agricul-		ENVIRONMENTAL MANAGEMENT
ECONOMICS Benefit of Water Pollution Control on Property Values, W74-04550 Application of Dynamic Programming in Markov Chains to the Evaluation of Water Quality in Irrigation, W74-04561 ECOSYSTEMS ECOSYSTEMS ECOSYSTEMS ECOSYSTEMS ECOSYSTEMS ECOSYSTEMS ECOGISTribution of Plutonium in Liquid Waste Disposal Areas at Los Alamos, W74-04443 SB EDUCATION Tenth Year Annual Report, Center for Research in Water Resources, University of Texas at Austin. W74-04559 SPA EFFLUENTS STREAMS Zone of Flow Establishment for Round Buoyant Jets, W74-04577 SB EFFLUENTS Mixing Processes, W74-04579 EEFLUENTS Mixing Processes, W74-04530 ELECTRIC POWER PRODUCTION ELECTRIC POWER PRODUCTION EConomic Power from Geothermal Heat, ECONOMICS EMBRYONIC GROWTH STAGE Temperature Requirements for Embryos and Larvae of the Northern Pike, Esox lucius (Temperature Requirements for Embryos and Larvae of the Northern Pike, Esox lucius (W74-04560 SC ENDANGERED SPECIES ENDANGERED SPEC			
ECONOMICS Benefit of Water Pollution Control on Property Values, W74-04550 5G W74-04550 5G Application of Dynamic Programming in Markov Chains to the Evaluation of Water Quality in Irrigation, W74-04561 3C ECOSYSTEMS Ecodistribution of Plutonium in Liquid Waste Disposal Areas at Los Alamos, W74-04443 5B EDUCATION Tenth Year Annual Report, Center for Research in Water Resources, University of Texas at Austin. W74-04567 5B EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant 1ets, W74-04567 5B EFFLUENTS Mixing Processes, W74-04567 5B EFFLUENTS Mixing Processes, W74-04567 5B EFFLUENTS Mixing Processes, W74-04568 ENARY STREAMS Zone of Flow Establishment for Round Buoyant 1ets, W74-04567 5B EFFLUENTS Mixing Processes, W74-04567 5B EFFLUENTS Mixing Processes, W74-04568 ENARY STREAMS Zone of Flow Establishment for Round Buoyant 1ets, W74-04567 5B EFFLUENTS Mixing Processes, W74-04567 5B EFFLUENTS Mixing Processes, W74-04568 ENARY SLOPE Shear Velocity in a Tidal Estuary, W74-04579 5B EFFLUENTS Mixing Processes, W74-04567 5B EFFLUENTS Mixing Processes, W74-04567 5B EFFLUENTS Mixing Processes, W74-04567 5B EFFLUENTS Mixing Processes, W74-04568 ENARONCHENT Profection Some Problems Involved in Optimal Protection of the Environment in Spas, W74-04686 4A ENVIRONMENTAL PROTECTION Some Problems Involved in Optimal Protection of the Environment in Spas, W74-04686 4A ENVIRONMENTAL PROTECTION Some Problems Involved in Optimal Protection of the Environment in Spas, W74-04686 4A ENVIRONMENTAL PROTECTION Some Problems Involved in Optimal Protection of the Environment in Spas, W74-04686 4A ENVIRONMENTAL PROTECTION Some Problems Involved in Optimal Protection of the Environment in Spas, W74-04686 4A ENVIRONMENTAL PROTECTION Some Problems Involved in Optimal Protection of the Environment in Spas, W74-04569 5C ENTEROY ILIA Extraction of Environment in Spas, W74-04500 5C ENTEROY ILIA Extraction of Shallow Mater Waves Over Topography, W74-04529 5E ENERGY SLOPE Sebacy VR4-04523 5E ENERGY SLOPE Sebacy VR4-04523 5E ENERGY SLOPE Seba	W74-04563 4B	W 14-04338 3A	
Temperature Requirements for Embryos and Larvae of the Northern Pike, Esox lucius (Linnaeus), W74-04550	FCONOMICS	EMBRYONIC GROWTH STAGE	W74-04503 5G
Values, W74-04550 5G Application of Dynamic Programming in Markov Chains to the Evaluation of Water Quality in Irrigation, W74-04561 3C ECOSYSTEMS Ecodistribution of Plutonium in Liquid Waste Disposal Areas at Los Alamos, W74-04463 5B EDUCATION Tenth Year Annual Report, Center for Research in Water Resources, University of Texas at Austin. W74-0459 9A EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Jets, W74-04657 5B EFFLUENTS Mixing Processes, W74-04327 5B ELASTIC THEORY Lee Engineering—Summary of Elastic Properties Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-04793 2C ELECTRIC POWER PRODUCTION Economic Power from Geothermal Heat, Earvae of the Northern Pike, Esox lucius (Linaneus), W74-04670 5C CAMPA-04670 5C CAMPA-04670 5C ENDANGERED SPECIES Death of the Marshes in the Ardennes, W74-04686 4A ENERGY SLOPE Shear Velocity in a Tidal Estuary, W74-04686 4A ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04323 2E ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04323 2E ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04323 2E ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04330 2E ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04330 2E ENGRICE SUPPLY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04323 2E ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04323 2E ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04323 2E ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04323 2E ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04323 2E ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04323 2E ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04323 2E ENERGY TRANSFER Harmonic Generation of Shallow Wa			PARTITION OF THE PROPERTY OF
W74-04550 Application of Dynamic Programming in Markov Chains to the Evaluation of Water Quality in Irrigation, W74-04561 CCOSYSTEMS ECOSYSTEMS ECOSYSTEMS ECOSTIBUTION Tenth Year Annual Report, Center for Research in Water Resources, University of Texas at Austin. W74-04459 EFFLUENTS STREAMS Zone of Flow Establishment for Round Buoyant Jets, W74-04657 SB EFFLUENTS Mixing Processes, W74-04527 SB ELASTIC THEORY Ice Engineering—Summary of Elastic Properies Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-04793 ELECTRIC POWER PRODUCTION ELECTRIC POWER PRODUCTION ECONOMIC POWER PRODUCTION ENTEROMACE ENTRACES IN Advance in the Ardennes, W74-04650 ENTEROMACE POWER PRODUCTION EVIL PROVINCE STANCE IN A EXPERIMENT IN ACCUMANT AND PROVINCE TO PROVINCE STANCE PROVINCE AND PROVINCE PROVI			
Application of Dynamic Programming in Markov Chains to the Evaluation of Water Quality in Irrigation, W74-04686 3C ECOSYSTEMS ECOGISTribution of Plutonium in Liquid Waste Disposal Areas at Los Alamos, W74-04643 5B EDUCATION Tenth Year Annual Report, Center for Research in Water Resources, University of Texas at Austin. W74-04059 9A EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Jets, W74-04657 5B EFFLUENTS Mixing Processes, W74-04327 5B ELASTIC THEORY Ice Engineering—Summary of Elastic Properties Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-04850 5B ELECTRIC POWER PRODUCTION Economic Power from Geothermal Heat, Research on Sewage, (In Russian), ENDANGERED SPECIES Death of the Marshes in the Ardennes, W74-04686 4A W74-04686 4A W74-04686 4A W74-04686 4A W74-04686 4A W74-04686 4A W74-04698 2L ENERGY SLOPE Shear Velocity in a Tidal Estuary, W74-04500 2L W74-04629 2L ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04323 2E W74-04323 2E ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04330 2E ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04330 2E ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04330 2E ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04330 2E ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04330 2E ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04330 2E ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04330 2E ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04330 2E ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04330 2E ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04330 2E ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography (W74-04650 5D ENGTOR TRANSFER Harmonic G			
Application of Dynamic Programming in Markov Chains to the Evaluation of Water Quality in Irrigation, W74-04561 3C ECOSYSTEMS ECOSYSTEMS Ecodistribution of Plutonium in Liquid Waste Disposal Areas at Los Alamos, W74-04443 5B EDUCATION Tenth Year Annual Report, Center for Research in Water Resources, University of Texas at Austin. W74-04595 9A W74-04309 2E EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Jets, W74-04577 5B EFFLUENTS Mixing Processes, W74-04327 5B ELASTIC THEORY Ice Engineering—Summary of Elastic Properties Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-04793 2C ELECTRIC POWER PRODUCTION Economic Power from Geothermal Heat, ENDARGERED SPECIES Death of the Marshes in the Ardennes, W74-04686 4A W74-04686 W74-04600 SE ENERGY SLOPE Shear Velocity in a Tidal Estuary, W74-04600 Call Environment Shallow Water Waves Over Topography, W74-04629 2L ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04306 2l ENERGY SLOPE Shear Velocity in a Tidal Estuary, W74-04600 2l W74-04629 2L ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04306 2l ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04306 2l ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04306 2l ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04306 2l ENERGY SLOPE Shear Velocity in a Tidal Estuary, W74-04600 2l ENERGY SLOPE Shear Velocity in a Tidal Estuary, W74-04600 2l ENERGY SLOPE Shear Velocity in a Tidal Estuary, W74-04600 2l ENERGY SLOPE Shear Velocity in a Tidal Estuary, W74-04600 2l ENERGY SLOPE Shear Velocity in a Tidal Estuary, W74-04600 2l ENERGY SLOPE Shear Velocity in a Tidal Estuary, W74-04600 2l ENERGY SLOPE Shear Velocity in a Tidal Estuary, W74-04600 2l ENERGY SLOPE Shear Velocity in a Tidal Estuary, W74-04600 2l ENERGY SLOPE Shear Velocity in a Tidal Estuar		W74-04670 SC	
kov Chains to the Evaluation of Water Quality in Irrigation, W74-04561 3C ECOSYSTEMS ECOGISTribution of Plutonium in Liquid Waste Disposal Areas at Los Alamos, W74-04443 5B EDUCATION Tenth Year Annual Report, Center Research in Water Resources, University of Texas at Austin. W74-04595 W74-04595 EFFLUENT STREAMS Zone of Flow Establishment Buoyant Jets, W74-04657 W74-04657 5B EFFLUENTS Mixing Processes, W74-04327 SEFFLUENTS Mixing Processes, W74-04327 SB ELASTIC THEORY Ice Engineering—Summary of Elastic Properties Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-04793 ELECTRIC POWER PRODUCTION Economic Power from Geothermal Heat, Death of the Marshes in the Ardennes, W74-04666 SC ENERGY SLOPE Shear Velocity in a Tidal Estuary, W74-04509 ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04323 2E ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04323 2E ENERGY SLOPE Shear Velocity in a Tidal Estuary, W74-04509 ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04323 2E ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04323 2E ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04323 2E ENERGY SLOPE Shear Velocity in a Tidal Estuary, W74-04629 2L ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04533 2E ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04509 2E ENERGY SLOPE Shear Velocity in a Tidal Estuary, W74-04629 2L ENERGY SLOPE Shear Velocity in a Tidal Estuary, W74-04629 2L ENERGY SLOPE Shear Velocity in a Tidal Estuary, W74-04629 2L ENERGY SLOPE Shear Velocity in a Tidal Estuary, W74-04629 2E ENERGY SLOPE Shear Velocity in a Tidal Estuary, W74-04629 2E ENERGY SLOPE Shear Velocity in a Tidal Estuary, W74-04609 2E ENERGY SLOPE Shear Velocity in a Tidal Estuary, W74-04600 2E ENERGY SLOPE Shear Velocity in a Tidal Estuar		ENDANGERED SPECIES	W/10101/
W74-04561 ECOSYSTEMS ECOGISTribution of Plutonium in Liquid Waste Disposal Areas at Los Alamos, W74-04443 SB EDUCATION Tenth Year Annual Report, Center for Research in Water Resources, University of Texas at Austin. W74-04595 Physical and Dynamical Scales for Generation of Wind Waves, W74-04595 EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Jets, W74-0457 EFFLUENTS Mixing Processes, W74-04327 SB ELASTIC THEORY LCE Engineering—Summary of Elastic Properties Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-04793 ELASTIC THEORY ELASTIC THEORY ELASTIC THEORY ELASTIC THEORY ELECTRIC POWER PRODUCTION Economic Power from Geothermal Heat, ENERGY SLOPE Shear Velocity in a Tidal Estuary, W74-04629 2L ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Tropography, W74-04323 2E Physical and Dynamical Scales for Generation of Wind Waves, W74-04330 ENGINEERING EDUCATION Environmental Chemistry: Air and Water Pollution, W74-04513 ENGINEERING EDUCATION Environmental Chemistry: Air and Water Pollution, W74-04513 ENTEROBACTERIA Salmonella Serotypes in Sewage of Various Origins, W74-04850 ENTEROVIRUSES An Experiment in Sanitary-Virological Research on Sewage, (In Russian), EPILEMNION Movements of Phosphorus Between its Biologically Important Forms in Lake Water, ENTEROVIRUSES An Experiment in Sanitary-Virological Research on Sewage, (In Russian),		Death of the Marshes in the Ardennes,	
ECOSYSTEMS ECOdistribution of Plutonium in Liquid Waste Disposal Areas at Los Alamos, W74-04443 5B EDUCATION Tenth Year Annual Report, Center for Research in Water Resources, University of Texas at Austin. W74-0459 9A EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Jets, W74-04657 5B EFFLUENTS Mixing Processes, W74-04327 5B ELASTIC THEORY Ice Engineering—Summary of Elastic Properties Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-04830 5B ENERGY SLOPE Shear Velocity in a Tidal Estuary, W74-04629 2L ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04323 2E Physical and Dynamical Scales for Generation of Wind Waves, W74-04330 2E ENGINEERING EDUCATION Environmental Chemistry: Air and Water Pollution, W74-04513 5B EFFLUENTS Mixing Processes, W74-04327 5B ELASTIC THEORY Ice Engineering—Summary of Elastic Properties Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-04830 5B ENTEROBACTERIA Salmonella Serotypes in Sewage of Various Origins, W74-04850 5B ENTEROVIRUSES An Experiment in Sanitary-Virological Research on Sewage, (In Russian), Movements of Phosphorus Between its Biologically Important Forms in Lake Water, Cally Important Forms in Lake Water, W74-0480 5P EPILIMNION Movements of Phosphorus Between its Biologically Important Forms in Lake Water, Cally Important Forms in Lake Water, Cally Important Forms in Lake Water, Chrysaora quinquecirrha, W74-04660 5C W74-04660 5C W74-04660 5C W74-04660 5C EOLIAN DEPOSITION Ecolan Cross-Bedding in the Beach Dune Environment, Sapelo Island, Georgia, W74-04636 5D EPHEMEROPTERA (NYMPHS) Benthic Fauna of a Tropical Man-Made Lake (Volta Lake, Ghana 1965-1968), W74-04636 5D W74-04630		W74-04686 4A	
ECOSYSTEMS Ecodistribution of Plutonium in Liquid Waste Disposal Areas at Los Alamos, W74-04443 EDUCATION Tenth Year Annual Report, Center for Research in Water Resources, University of Texas at Austin. W74-04595 Shear Velocity in a Tidal Estuary, W74-04629 EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Jets, W74-04657 SB EFFLUENTS Mixing Processes, W74-04320 ELASTIC THEORY Ice Engineering-Summary of Elastic Properties Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-04793 ELECTRIC POWER PRODUCTION ECONOmic Power from Geothermal Heat, ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04320 Physical and Dynamical Scales for Generation of Wind Waves, W74-04330 2E ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04320 ELECTRIC POWER PRODUCTION ECONOMIC PROPERTY OF THE CONTROL OF T	W 74-04301 3C	ENERGY CLOBE	
Ecodistribution of Plutonium in Liquid Waste Disposal Areas at Los Alamos, W74-04443 SB EDUCATION Tenth Year Annual Report, Center for Research in Water Resources, University of Texas at Austin. W74-04595 SP EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Jets, W74-04657 SB EFFLUENTS Mixing Processes, W74-04327 SB ELASTIC THEORY Ice Engineering-Summary of Elastic Properties Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-04793 ELECTRIC POWER PRODUCTION Economic Power from Geothermal Heat, ECOLIATION EVALUATION ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04323 2E ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04323 2E Temperature Acclimation in the Medusa, Chrysaora quinquecirrha, W74-04660 5C ELICTRIC POWER PRODUCTION Environmental Chemistry: Air and Water Pol- lution, W74-04513 SB ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04320 ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04323 2E ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04393 2E ENLIANT DEPOSITION Environmental Chemistry: Air and Water Pol- lution, W74-04513 SB EPHEMEROPTERA (NYMPHS) Benthic Fauna of a Tropical Man-Made Lake (Volta Lake, Ghana 1965-1968), W74-04636 2H ENTEROBACTERIA Salmonella Serotypes in Sewage of Various Origins, W74-0450 SB ENTEROVIRUSES An Experiment in Sanitary-Virological Research on Sewage, (In Russian), Eventual Dynamical Scales for Generation Of Wind Waves, W74-04306 2I Emperature Acclimation in the Medusa, Chrysaora quinquecirrha, W74-04660 SC ENLIAN DEPOSITION Ecolian Cross-Bedding in the Beach Dune En- vironment, Sapelo Island, Georgia, W74-04737 2J EPHEMEROPTERA (NYMPHS) Benthic Fauna of a Tropical Man-Made Lake (Volta Lake, Ghana 1965-1968), W74-04636 2H ENTEROBACTERIA Salmonella Serotypes in Sewage of Various Origins, W74-04850 SB ENTEROWINES An Experiment in Sanitary-Virolog	ECOSYSTEMS		W74-04500 6B
Disposal Areas at Los Alamos, W74-04443 5B ENERGY TRANSFER Harmonic Generation of Shallow Water Waves Over Topography, W74-04306 2I EDUCATION Tenth Year Annual Report, Center for Research in Water Resources, University of Texas at Austin. W74-04595 9A PA-04323 2E Physical and Dynamical Scales for Generation of Wind Waves, W74-04300 2E Physical and Dynamical Scales for Generation of Wind Waves, W74-04300 2E Physical and Dynamical Scales for Generation of Wind Waves, W74-04300 2E Physical and Dynamical Scales for Generation of Wind Waves, W74-04300 2E Physical and Dynamical Scales for Generation of Wind Waves, W74-04300 2E Physical and Dynamical Scales for Generation of Wind Waves, W74-04300 2E Physical and Dynamical Scales for Generation of Wind Waves, W74-04300 2E Physical and Dynamical Scales for Generation of Wind Waves, W74-04300 2E Physical and Dynamical Scales for Generation of Wind Waves, W74-04330 3E Physical and Dynamical Scales for Generation of Wind Waves, W74-04300 2E Physical and Dynamical Scales for Generation of Wind Waves, W74-04300 2E Physical and Dynamical Scales for Generation of Wind Waves, W74-04300 2E Physical and Dynamical Scales for Generation of Wind Waves, W74-04300 2E Physical and Dynamical Scales for Generation of Wind Waves, W74-04300 2E Physical and Dynamical Scales for Generation of Wind Waves, W74-04300 2E Physical and Dynamical Scales for Generation of Wind Waves, W74-04300 3E Physical and Dynamical Scales for Generation of Wind Waves, W74-04300 3E Physical and Dynamical Scales for Generation of Wind Waves, W74-04300 3E Physical and Dynamical Scales for Generation of Wind Waves, W74-04300 3E Physical and Dynamical Scales for Generation of Wind Waves, W74-04560 5D Physical and Dynamical Scales for Generation of Wind Waves, W74-04560 5D Physical And Dynamical Scales for Generation of Wind Waves, W74-04560 5D Physical And Dynamical Scales for Generation of Wind Waves, W74-04560 5D Physical And Dynamical Scales for Generation of Wind Waves, W74-04560 5D Physical And Dynamical Scales	Ecodistribution of Plutonium in Liquid Waste		ENZYMES
EDUCATION Tenth Year Annual Report, Center for Research in Water Resources, University of Texas at Austin. W74-04595 9A EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Jets, W74-04657 EFFLUENTS Mixing Processes, W74-04327 EFFLUENTS Mixing Processes, W74-04327 EEFFLUENTS Mixing Processes, W74-04546 ELASTIC THEORY Ice Engineering-Summary of Elastic Properties Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-04793 ELECTRIC POWER PRODUCTION Economic Power from Geothermal Heat, EDUCATION W74-044323 2E Temperature Acclimation in the Medusa, Chrysaora quinquecirrha, W74-04660 5C Temperature Acclimation in the Medusa, Chrysaora quinquecirrha, W74-04660 5C EOLIAN DEPOSITION Eolian Cross-Bedding in the Beach Dune Environment, Sapelo Island, Georgia, W74-04737 2J EPHEMEROPTERA (NYMPHS) Benthic Fauna of a Tropical Man-Made Lake (Volta Lake, Ghana 1965-1968), W74-04636 2H ENTEROBACTERIA Salmonella Serotypes in Sewage of Various Origins, W74-04850 ENTEROURUSES An Experiment in Sanitary-Virological Research on Sewage, (In Russian), Movements of Phosphorus Between its Biologically Important Forms in Lake Water,			
Harmonic Generation of Shallow Water Waves Over Topography, W74-04306 Tenth Year Annual Report, Center for Research in Water Resources, University of Texas at Austin. W74-04595 9A EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Jets, W74-04657 5B EFFLUENTS Mixing Processes, W74-04327 5B ELASTIC THEORY Ice EngineeringSummary of Elastic Properties Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-04793 2C ELECTRIC POWER PRODUCTION Economic Power from Geothermal Heat, EATHorn Center for Research and Seearch and S	W74-04443 5B		
Tenth Year Annual Report, Center for Research in Water Resources, University of Texas at Austin. W74-04595 SPA EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Jets, W74-04657 SPA EFFLUENTS Mixing Processes, W74-04327 EEFFLUENTS Mixing Processes, W74-04327 SPA ELASTIC THEORY Ice Engineering—Summary of Elastic Properties Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-04793 ELECTRIC POWER PRODUCTION Economic Power from Geothermal Heat, ENGINEERING EDUCATION Environmental Chemistry: Air and Water Pollution, Environmental Chemistry: Air and Water Pollution, Environmental Processes for Water Quality Control, W74-04513 Physicochemical Processes for Water Quality Control, W74-04546 SD ENTEROBACTERIA Salmonella Serotypes in Sewage of Various Origins, W74-04850 SB ENTEROBACTERIA Salmonella Serotypes in Sewage of Various Origins, W74-04850 ENTEROVIRUSES An Experiment in Sanitary-Virological Research on Sewage, (In Russian), EPILIMNION Movements of Phosphorus Between its Biological cally Important Forms in Lake Water,	PRICATION		
Research in Water Resources, University of Texas at Austin. W74-04595 9A EFFLUENT STREAMS Zone of Flow Establishment for Round Buoyant Jets, W74-04657 5B EFFLUENTS Mixing Processes, W74-04327 5B ELASTIC THEORY Ice Engineering—Summary of Elastic Properties Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-04793 ELECTRIC POWER PRODUCTION Economic Power from Geothermal Heat, Physical and Dynamical Scales for Generation of Wind Waves, W74-04330 2E EOLIAN DEPOSITION Eolian Cross-Bedding in the Beach Dune Environment, Sapelo Island, Georgia, W74-04513 5B EPHEMEROPTERA (NYMPHS) Benthic Fauna of a Tropical Man-Made Lake (Volta Lake, Ghana 1965-1968), W74-04636 2H ENTEROBACTERIA Salmonella Serotypes in Sewage of Various Origins, W74-04850 5B ENTEROBACTERIA Salmonella Serotypes in Sewage of Various Origins, W74-04850 ENTEROVIRUSES An Experiment in Sanitary-Virological Research on Sewage, (In Russian), Economic Power from Geothermal Heat,			
Texas at Austin. W74-04595 9A Physical and Dynamical Scales for Generation of Wind Waves, W74-04660 9A EFFLUENT STREAMS Zone of Flow Establishment for Buoyant Jets, W74-04657 5B ENGINEERING EDUCATION Environmental Chemistry: Air and Water Pollution, W74-04513 5B EFFLUENTS Mixing Processes, W74-04327 5B ELASTIC THEORY Ice Engineering—Summary of Elastic Properties Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-04793 2C ELECTRIC POWER PRODUCTION Economic Power from Geothermal Heat, Physical and Dynamical Scales for Generation of Wind Waves, W74-04630 2E ENGINEERING EDUCATION Environmental Chemistry: Air and Water Pollution, W74-04513 5B Physicochemical Processes for Water Quality Control, W74-04566 5D ENGINEERING EDUCATION Environment, Sapelo Island, Georgia, W74-04737 2J EPHEMEROPTERA (NYMPHS) Benthic Fauna of a Tropical Man-Made Lake (Volta Lake, Ghana 1965-1968), W74-04636 2H ENTEROBACTERIA Salmonella Serotypes in Sewage of Various Origins, W74-04850 5B ENTEROVIRUSES An Experiment in Sanitary-Virological Research on Sewage, (In Russian), Salmonella Serotypes in Lake Water,		W 14-04323 ZE	
W74-04595 W74-04595 EFFLUENT STREAMS Zone of Flow Establishment for Buoyant Jets, W74-04657 ENGINEERING EDUCATION Environmental Chemistry: Air and Water Pollution, W74-04513 EFFLUENTS Mixing Processes, W74-04327 ELASTIC THEORY Ice Engineering—Summary of Elastic Properties Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-04793 ELECTRIC POWER PRODUCTION ECONOMIC POWER FRODUCTION ECONOMIC POWER from Geothermal Heat, To Wind Waves, W74-04330 ENGINEERING EDUCATION Environmental Chemistry: Air and Water Pollution, W74-04513 ENGINEERING EDUCATION Environmental Chemistry: Air and Water Pollution, W74-04513 ENGINEERING EDUCATION Environmental Chemistry: Air and Water Pollution, W74-04513 ENGINEERING EDUCATION Environment, Sapelo Island, Georgia, W74-04737 EPHEMEROPTERA (NYMPHS) Benthic Fauna of a Tropical Man-Made Lake (Volta Lake, Ghana 1965-1968), W74-04636 ENTEROBACTERIA Salmonella Serotypes in Sewage of Various Origins, W74-04850 To Salmonella Serotypes in Sewage of Various Origins, W74-04850 EPILIMNION Movements of Phosphorus Between its Biologically Important Forms in Lake Water,		Physical and Dynamical Scales for Generation	
## W74-04330 Seff Luent Streams		of Wind Waves,	11.1-01000 SC
Zone of Flow Buoyant Jets, W74-04657 Environmental Chemistry: Air and Water Pollution, W74-04737 EFFLUENTS Mixing Processes, W74-04327 ELASTIC THEORY Ice Engineering-Summary of Elastic Properties Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-04793 ELECTRIC POWER PRODUCTION Environmental Chemistry: Air and Water Pollution, W74-04513 ENTEROBACTERIA Salmonella Processes for Water Quality Control, W74-04636 ENTEROBACTERIA Salmonella Serotypes in Sewage of Various Origins, W74-04850 ENTEROBACTERIA Salmonella Serotypes in Sewage of Various Origins, W74-04850 ENTEROVIRUSES An Experiment in Sanitary-Virological Research on Sewage, (In Russian), EPHEMEROPTERA (NYMPHS) Benthic Fauna of a Tropical Man-Made Lake (Volta Lake, Ghana 1965-1968), W74-04636 EPHEMEROPTERA (NYMPHS) Benthic Fauna of a Tropical Man-Made Lake (Volta Lake, Ghana 1965-1968), W74-04636 EPHEMEROPTERA (NYMPHS) Benthic Fauna of a Tropical Man-Made Lake (Volta Lake, Ghana 1965-1968), W74-04636 EPHEMEROPTERA (NYMPHS) Benthic Fauna of a Tropical Man-Made Lake (Volta Lake, Ghana 1965-1968), W74-04636 EPHEMEROPTERA (NYMPHS) Benthic Fauna of a Tropical Man-Made Lake (Volta Lake, Ghana 1965-1968), W74-04636 ENTEROBACTERIA Salmonella Serotypes in Sewage of Various Origins, W74-04850 Salmonella Serotypes in Sewage of Various Origins, W74-04850 EPHEMEROPTERA (NYMPHS) Benthic Fauna of a Tropical Man-Made Lake (Volta Lake, Ghana 1965-1968), W74-04636 EPHEMEROPTERA (NYMPHS) Benthic Fauna of a Tropical Man-Made Lake (Volta Lake, Ghana 1965-1968), W74-04636 ENTEROBACTERIA Salmonella Serotypes in Sewage of Various Origins, W74-04850 Salmonella Seroty		W74-04330 2E	EOLIAN DEPOSITION
EFFLUENTS Mixing Processes, W74-04327 ELASTIC THEORY Ice Engineering—Summary of Elastic Properties Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-04793 ELECTRIC POWER PRODUCTION Economic Power from Geothermal Heat, Environmental Chemistry: Air and Water Pollution, W74-04513 ENVIRONMENT, Sapelo Island, Georgia, W74-04573 EPHEMEROPTERA (NYMPHS) Benthic Fauna of a Tropical Man-Made Lake (Volta Lake, Ghana 1965-1968), W74-04636 EPIDEMIOLOGY Salmonella Serotypes in Sewage of Various Origins, W74-04850 ENTEROBACTERIA Salmonella Serotypes in Sewage of Various Origins, W74-04850 ENTEROVIRUSES An Experiment in Sanitary-Virological Research on Sewage, (In Russian), Economic Power from Geothermal Heat,		ENGINEEDING EDUCATION	Eolian Cross-Bedding in the Beach Dune En-
W74-04657 W74-04657 SB lution, W74-04513 SB EPHEMEROPTERA (NYMPHS) EFFLUENTS Mixing Processes, W74-04327 SB Physicochemical Processes for Water Quality Control, W74-04546 SD W74-04636 SD W74-04636 Benthic Fauna of a Tropical Man-Made Lake (Volta Lake, Ghana 1965-1968), W74-04636 SP W74-0463			
FFLUENTS Mixing Processes, W74-04327 ELASTIC THEORY Ice Engineering-Summary of Elastic Properties Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-04793 ELECTRIC POWER PRODUCTION Economic Power from Geothermal Heat, W74-04513 5B W74-04513 5B Physicochemical Processes for Water Quality Control, W74-04546 5D W74-04636 EPIDEMIOLOGY Salmonella Serotypes in Sewage of Various Origins, W74-04850 5B ENTEROBACTERIA Salmonella Serotypes in Sewage of Various Origins, W74-04850 5B ENTEROVIRUSES An Experiment in Sanitary-Virological Research on Sewage, (In Russian), Movements of Phosphorus Between its Biological research and Important Forms in Lake Water,			W74-04737 2J
EFFLUENTS Mixing Processes, W74-04327 5B Physicochemical Processes for Water Quality Control, W74-04546 5D ELASTIC THEORY Ice Engineering-Summary of Elastic Properties Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-04793 ELECTRIC POWER PRODUCTION Economic Power from Geothermal Heat, ENTEROBACTERIA Salmonella Serotypes in Sewage of Various Origins, W74-04850 ENTEROVIRUSES An Experiment in Sanitary-Virological Research on Sewage, (In Russian), Benthic Fauna of a Tropical Man-Made Lake (Volta Lake, Ghana 1965-1968), W74-04636 EPIDEMIOLOGY Salmonella Serotypes in Sewage of Various Origins, W74-04850 5B EPILIMNION Movements of Phosphorus Between its Biological Research on Sewage, (In Russian), Cally Important Forms in Lake Water,	W/4-0403/	W74-04513 5B	EPHEMEROPTERA (NVMPHS)
Mixing Processes, W74-04327 5B ELASTIC THEORY Ice Engineering—Summary of Elastic Properties Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-04793 ELECTRIC POWER PRODUCTION Economic Power from Geothermal Heat, ENTEROBACTERIA Salmonella Serotypes in Sewage of Various Origins, W74-04850 ENTEROBACTERIA Salmonella Serotypes in Sewage of Various Origins, W74-04850 ENTEROVIRUSES ENTEROVIRUSES An Experiment in Sanitary-Virological Research on Sewage, (In Russian), Cally Important Forms in Lake Water,	EFFLUENTS	m - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	
W74-04327 5B CONTROLL W74-04326 5D W74-04636 2H ELASTIC THEORY Ice Engineering—Summary of Elastic Properties Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-04793 ELECTRIC POWER PRODUCTION Economic Power from Geothermal Heat, ENTEROBACTERIA Salmonella Serotypes in Sewage of Various Origins, W74-04850 5B ENTEROVIRUSES ENTEROVIRUSES An Experiment in Sanitary-Virological Research on Sewage, (In Russian), Movements of Phosphorus Between its Biological Cally Important Forms in Lake Water,			
ELASTIC THEORY Ice Engineering—Summary of Elastic Properties Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-04793 ELECTRIC POWER PRODUCTION Economic Power from Geothermal Heat, ENTEROBACTERIA Salmonella Serotypes in Sewage of Various Origins, W74-04850 Salmonella Serotypes in Sewage of Various Origins, W74-04850 SB W74-04850 EPILIMNION Movements of Phosphorus Between its Biological Research on Sewage, (In Russian), cally Important Forms in Lake Water,			
Ice Engineering-Summary of Elastic Properties Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-04793 ELECTRIC POWER PRODUCTION Economic Power from Geothermal Heat, ECONOMIC POWER PRODUCTION Economic Power from Geothermal Heat, ENEMBAGA I SERVINGS Salmonella Serotypes in Sewage of Various Origins, W74-04850 Salmonella Serotypes in Sewage of Various Origins, W74-04850 SEPILIMNION Movements of Phosphorus Between its Biological Research on Sewage, (In Russian), Economic Power from Geothermal Heat,	ET ACTIC THEODY		
ties Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-04793 ELECTRIC POWER PRODUCTION Economic Power from Geothermal Heat, ECONOMIC POWER FRODUCTION AN Experiment in Sanitary-Virological Research on Sewage, (In Russian), Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice, W74-04850 SB W74-04850 SB EPILIMNION Movements of Phosphorus Between its Biological Cally Important Forms in Lake Water,			
and Nonlinear Analysis of Saline Ice, W74-04850 5B W74-04			
W74-04793 2C ELECTRIC POWER PRODUCTION Economic Power from Geothermal Heat, Research on Sewage, (In Russian), EACH ENTEROVIRUSES An Experiment in Sanitary-Virological Research on Sewage, (In Russian), Cally Important Forms in Lake Water,			
ELECTRIC POWER PRODUCTION Economic Power from Geothermal Heat, ELECTRIC POWER PRODUCTION An Experiment in Sanitary-Virological Research on Sewage, (In Russian), EPILIMNION Movements of Phosphorus Between its Biological cally Important Forms in Lake Water,	The state of the s	W /4-04830 5B	11 / T-U1030
ELECTRIC POWER PRODUCTION An Experiment in Sanitary-Virological Movements of Phosphorus Between its Biological Cally Important Forms in Lake Water,		ENTEROVIRUSES	EPILIMNION
tresearch on possibly (an examination of the contract of the c			

EQUATIONS

EQUATIONS	ESTIMATED BENEFITS	EUROPE
On Solving the Unsaturated Flow Equation: 2.	Estimating the Benefits of Stream Valley and	Reservoirs of Europe and Some Aspects of
Critique of Parlange's Method.	Open Space Preservation Projects,	Their Construction and Multipurpose Use
W74-04492 2G	W74-04500 6B	(Vodokhranilishcha zarubezhnoy Yevropy i
The Calculation of Critical Discharge Velocity	Land Value Increments as a Measure of the	nekotoryye voprosy ikh sozdaniya i komplek-
of Streams in Uniform Flow and the Trans-	Net Benefits of Urban Water Supply Projects	snogo ispol'zovaniya), W74-04582 8A
ported Sediment Size,	in Developing Countries: Theory and Measure-	W74-04582 8A
W74-04800 2J	ment.	EUTROPHICATION
	W74-04502 6B	Nutrient Income Change Related to Plankton
The Problem of Critical Discharge in Sediment		Algae,
Motion,	ESTIMATING	W74-04318 5C
W74-04801 2J	Application of Regression Analysis to Estima-	Policial Characteristics of Co. No. Ho. Labor
EQUILIBRIUM PROFILE	tion of the Efficiency of Water Use in Irriga-	Ecological Characteristics of Go-No-Ike Lake,
The Effect of Wave Refraction on the Forma-	tion (Opyt primeneniya regressionnogo analiza k otsenke effektivnosti ispol'zovaniya vody pri	W74-04638 5C
tion of an Equilibrium Profile of Submarine	oroshenii),	Calculation of the Concentration of the
Coastal Slope,	W74-04580 3F	Biomass of Blue-Green Algae During Settling,
W74-04438 2J		(In Russian),
	ESTUARIES	W74-04645 5C
EQUIPMENT	A Three-Dimensional Model for Estuaries and	A THE STATE OF THE
Modern Waste Water Treatment and	Coastal Seas: Volume I, Principles of Compu-	Morphological Variation of Keratella cochlearis
Processing Techniques in the Paper and Board	tation,	(Gosse) (Rotatoria) in Several Masurian Lakes of Different Trophic Level,
Industry (Moderne Abwasseraufbereitungs-und	W74-04301 2L	W74-04696 5C
Verfahrenstechnik in der Papier- und Kartonin- dustrie).	Estuaries,	W/4-04030
W74-04517 5D	W74-04321 2L	Heterotrophic Utilization of Sucrose in an Ar-
W/4-0431/		tificially Enriched Lake,
EROSION	A Study of Diffusion in an Estuary,	W74-04781 5C
Thermokarst Development, Banks Island,	W74-04333 5B	The state of the 207 to 4444
Western Canadian Arctic,	Shares and Share December	Eutrophication of Lake 227 by Addition of
W74-04368 2C	Shores and Shore Processes, W74-04339 2L	Phosphate and Nitrate: The Second, Third, and
For the state of t	W/4-04339 2L	Fourth Years of Enrichment, 1970, 1971, and 1972,
Environmental Considerations for the Utiliza- tion of Permafrost Terrain.	Estuarine Currents and Tidal Streams,	W74-04789 5C
W74-04407 2C	W74-04344 2L	W/4-04/05
W/4-0440/		EVALUATION
Some Effects of Surface Disturbance on the	Sediment Movement at Indian Ports,	Application of Dynamic Programming in Mar-
Permafrost Active Layer at Inuvik, N.W.T.,	W74-04345 2L	kov Chains to the Evaluation of Water Quality
Canada,	Some Results of Regional Coastal Investiga-	in Irrigation,
W74-04413 4C	tions in the USSR,	W74-04561 3C
	W74-04426 2J	A Simulation Model for Evaluation Importion
Some Data on the Post-Glacial Evolution of	2	A Simulation Model for Evaluating Irrigation Management Practices,
Karkinit Bay and the Accumulation of Bottom	Application of Fluorescent Coated Sand in Lit-	W74-04564 3F
Sediments Within it, W74-04429 21	toral Drift and Inlet Studies,	W/4-04304
W74-04429 2J	W74-04616 2L	Comments on Johnson's Paper, 'On the Wind-
Recent Development of the Temryuk Coast on	Characteristic Control of the Contro	Driven Circulation of a Stratified Ocean',
the Azov Sea.	Shear Velocity in a Tidal Estuary,	W74-04675 2E
W74-04430 2J	W74-04629 2L	
	Use of a Computational Model for Two-Dimen-	EVAPORATION
Some Data on the Post-Glacial Transgression	sional Tidal Flow,	Solar Energy for the Concentration of Pulp Mill
of the Bering Sea,	W74-04631 2L	Effluents,
W74-04431 2J		W74-04544 5D
Effect of the Forest on the Displacement of the	Reproduction of Estuarine Structure and Cur-	EVAPORATORS
Desna River Bed and the Significance of this	rent Observation Techniques in the Hecate	Effects of Condensates on the Toxicity of
Effect on Forest Planting in the Floodplain, (In	Model,	Kraft Pulp Mill Effluents,
Russian),	W74-04724 2L	W74-04521 5D
W74-04641 4A	An Annotated Bibliography of Flushing and	
	Dispersion in Tidal Waters,	EVAPOTRANSPIRATION
Sea Waves and Beach Cusps,	W74-04731 2L	Modeling of Turbulent Transport in the Surface
W74-04734 2J		Layer,
Poort Profiles of a Consolia Province Internal	New Dimensions in Estuary Classification,	W74-04795 2D
Beach Profiles of a Georgia Barrier Island,	W74-04735 2L	EVERGREEN SCRUBS
W74-04736 2J	The Archesis of Westerned Potential Statement	Contribution to Knowledge about the Leaf
Drastic Beach Changes in a Low-Energy En-	The Analysis of Harbor and Estuary Systems, W74-04745 2L.	Anatomy of Species of a 'Caatinga' of the Rio
vironment Caused by Hurricane Betsy,	W74-04745 2L	Negro (Amazon), (In Portuguese),
W74-04756 2J	Phenomena Affecting Improvement of the	W74-04682 2I
	Lower Columbia Estuary and Entrance,	
Response and Recovery of a Piedmont	W74-04763 2L	EXCAVATION
Watershed from Tropical Storm Agnes, June		Hydraulic Performance of BridgesExcava-
1972,	Coastal-Water Vegetation of the Lower	tions at Bridges,
W74-04805 2J	Reaches of the Dnestr (In Russian),	W74-04482 8B
EROSION RATES	W74-04813 2L	EXPANSIVE SOILS
Rates of Mass Wasting in the Ruby Range,	ESTURARIES	Measurement of Moisture Diffusivity of Wet
Yukon Territory,	Constituent Transport in Estuaries,	Swelling Systems,
W74-04371 2J	W74-04627 2L	W74-04493 2G

EXPLORATION	FERTILIZERS	FISH BARRIERS
The Need of Geological Investigations for the Development of the Ground Water Resources	Phosphorus Relationships in Runoff from Fer- tilized Soils,	Conduit Structure for Migrating Fish, W74-04715 8I
of the Republic of Korea, W74-04466 4B	W74-04471 5B	FISH BEHAVIOR
	Nutrients in Subsurface and Runoff Waters of	Thermal Responses in Cirrhina mrigala Fry,
Possible Application of Remote Sensing for Underground Water Exploration in Turkey,	the Holland Marsh, Ontario, W74-04478 5B	W74-04661 5C
W74-04568 7B	Paper Mill Sludge Disposal on Soils: Effects on	Effect of Light on Vulnerability of Heat- Stressed Sockeye Salmon to Predation by Coho
EXPLOSIVES A Proposal for the Investigation of Possible	the Yield and Mineral Nutrition of Oats (Avena satival.).	Salmon, W74-04671 5C
Ground-Water Contamination in the Bangor	W74-04519 5E	
Area, Kitsap County, Washington, W74-04491 5B	Some Neglected Sources of Water Pollution	Apparatus for Recording Avoidance Move- ments of Fish.
	(Nedostatochno uchityvayemyye istochniki	W74-04776 5A
FAIRBANKS (ALAS) Geochemistry of Permafrost and Quaternary	zagryazneniya prirodnykh vod), W74-04579 5B	FISH DIETS
Stratigraphy,		Morphology and Life Style of the Turkestan
W74-04364 2C	Soluble Phosphate Output of an Agricultural Watershed in Pennsylvania,	Gudgeon Gobio gobio lepidolaemus Kessler in
FALLOUT	W74-04804 5B	Waters of the Sukhan-Darya Basin, (In Russian),
Strontium-90 and Cesium-137 Levels in Soils of	Utilization of Nutrients from Soil and Fertil-	W74-04650 8I
Various Types at Niigata Prefecture, Japan, W74-04453 5B	izers by Pasture Grass as Dependent on Soil	FISH HATCHERIES
	Moisture (In Russian),	Pink and Chum Salmon Culture,
Trans-Pacific Fallout and Protective Counter- measures.	W74-04820 4A	W74-04797 8I
W74-04454 5B	Effect of Fertilizers and Irrigation Conditions	FISH MIGRATION
FARM WASTES	on Yield, Chemical Composition, Baking Quali- ties of Winter Wheat Grain of Bezostaya 1 Cul-	Conduit Structure for Migrating Fish,
Some Neglected Sources of Water Pollution	tivar, (In Russian),	W74-04715 8I
(Nedostatochno uchityvayemyye istochniki	W74-04830 3F	FISH PASSAGES
zagryazneniya prirodnykh vod), W74-04579 5B	FETCH	Conduit Structure for Migrating Fish,
	Physical and Dynamical Scales for Generation	W74-04715 8I
FATE OF POLLUTANTS Laboratory Studies of the Accommodation of	of Wind Waves, W74-04330 2E	FISH PHYSIOLOGY
Some Crude and Residual Fuel Oils in Sea	W 74-04330 ZE	Effects of Temperature on Developing Meristic
Water,	Approximate Estimations of Correlation Coef-	Structures of Smallmouth Bass, Micropterus dolomieui Lacepede.
W74-04775 5B	ficient Between Wave Height and Period of Shallow Water Wind Waves,	W74-04663 5C
FATHEAD MINNOWS	W74-04761 2L	FISH POPULATIONS
The Effects of Methoxychlor on Aquatic Biota, W74-04553 5C	FILTERS	Vertical Distribution of Fishes Relative to
	Gravity Dewatering: Application to Paper Mill	Physical, Chemical and Biological Features in
FATTY-ACIDS A Possible Explanation for the Differences in	Wastes,	Two Central Arizona Reservoirs, W74-04474 5C
the Fatty Acid Composition of Fresh-Water	W74-04533 5D	
and Marine Fishes,	FILTRATION	FISH REPRODUCTION The Effects of Methoxychlor on Aquatic Biota,
W74-04688 5C	Gravity Dewatering: Application to Paper Mill Wastes,	W74-04553 5C
FAULTS (GEOLOGIC) Waves Generated by Horizontal Motion of a	W74-04533 5D	Morphology and Life Style of the Turkestan
Wall,	Papermill Treatment Plant for Small Industry.	Gudgeon Gobio gobio lepidolaemus Kessler in
W74-04760 8B	W74-04534 5D	Waters of the Sukhan-Darya Basin, (In Rus-
FEDERAL GOVERNMENT	Water Purification,	sian), W74-04650 8I
What's Wrong with Government Water Control	W74-04706 5F	
Programs and how They can be Improved, W74-04632 5D	Sedimentation Tanks,	Sex Cycle, Spawning and Fertility of West Siberian Crucians in the Steppe Lakes, (In Rus-
FEEDING HABITS	W74-04708 5D	sian),
The Feeding of Pelecus Cultratus L. in Kairak-	FINITE ELEMENT ANALYSIS	W74-04689 2H
kum Reservoir, (In Russian),	The Application of Numerical Simulation	FISH TAXONOMY
W74-04695 2H	Models in the Assessment of the Effect of Discharges into Coastal Waters,	Hybridization Between the Darters Percina
FERMENTATION	W74-04674 5B	crassa roanoka and Percina oxyrhyncha (Percidae, Etheostomatini), with Comments on
Finland Starts Production of Protein from Black Liquor.	FINLAND	the Distribution of Percina crassa roanoka in
W74-04526 5D	Finland Starts Production of Protein from	New River,
FERTILITY	Black Liquor.	W74-04472 2E
Sex Cycle, Spawning and Fertility of West	W74-04526 5D	FISHERIES
Siberian Crucians in the Steppe Lakes, (In Rus-	Effects of Toxicants on Brackish-Water	Parasite Fauna of Ctenopharyngodon idella from Pond- and Spawning-Nursery Fisheries in
sian), W74-04689 2H	Phytoplankton Assimilation, W74-04644 5C	the Volga Delta, (In Russian),
		W74-04702 81
FERTILIZATION A Study on the Depth of Basic Tillage and Soil	FISH The Preferred Temperature of Fish and Their	FISHERY SURVEY
Fertilization for Maize Grown Under Irrigation,	Midsummer Distribution in Temperate Lakes	Fishery Survey Carried out at Lake Borullus,
(In Bulgarian), W74-04828 3F	and Streams, W74-04666 5C	A. R. E., in the Spring of 1971, (In Czech), W74-04643
VT020	11.1-01000	211

FJORDS

FJORDS	Effects of Backpumping from South New	Wave Forecasting Relationships for the Gulf of
Some Results of Regional Coastal Investiga- tions in the USSR,	River Canal at Pump Station S-9 on Quality of Water in Water-Conservation Area 3, Broward	Mexico, W74-04729 2E
W74-04426 2J	County, Florida,	W/4-04/2)
	W74-04600 5B	Numerical Computations of Storm Surges with
Studies of a Southern Fiord. W74-04727 2J	Hydrologic and Geologic Considerations for	Bottom Stress, W74-04759 2L
W74-04727 2J	Solid-Waste Disposal in West-Central Florida,	11-0-135
FLOCCULATION	W74-04605 5E	FOREIGN RESEARCH
Mercury Removal from Waste Water with	Application of Fluorescent Coated Sand in Lit-	The Need of Geological Investigations for the Development of the Ground Water Resources
Starch Xanthate-Cationic Polymer Complex, W74-04541 5D	toral Drift and Inlet Studies,	of the Republic of Korea,
W/4-04541	W74-04616 2L	W74-04466 4B
Process for Purifying Water that Contains Or-	Quantitative Tracing of Littoral Drift,	FOREST PLANTING
ganic Matter, W74-04716 5D	W74-04617 2J	Effect of the Forest on the Displacement of the
1177710	A Field Investigation of Sand Transport in the	Desna River Bed and the Significance of this
Method of Treating Sewage Using High	Surf Zone,	Effect on Forest Planting in the Floodplain, (Ir
Polymer Ratio Flocculation Agent Biologically Produced in Situ,	W74-04619 2J	Russian), W74-04641 4A
W74-04717 5D	Drastic Beach Changes in a Low-Energy En-	
T con courne	vironment Caused by Hurricane Betsy,	FORESTS Contraction of Contract 122
FLOOD CONTROL Approaches to Stormwater Management,	W74-04756 2J	Annual Consumption of Cesium-137 and Cobalt-60 Labeled Pine Seeds by Small Mam-
W74-04458 5A	FLOTATION	mals in an Oak-Hickory Forest,
	Mechanical Clarification of Industrial Waste	W74-04450 5E
Flood Proofing Decisions Under Uncertainty: An Application to the Connecticut River Basin,	Waters (Mechanische Klaerung von Indus-	FORT LOUDOUN RESERVOIR (TENN
W74-04463 6A	trieabwaessern).	Remote Sensing in Sampling Site Location in
	W74-04515 5D	Lakes and Streams,
FLOOD DAMAGE	FLOTSAM	W74-04313 5A
Flood Proofing Decisions Under Uncertainty: An Application to the Connecticut River Basin.	Skimmer Trap,	FRANCE (ARDENNES PLATEAU)
W74-04463 6A	W74-04713 5G	Death of the Marshes in the Ardennes,
ET OOD FOREGA CRING	FLUCTUATIONS	W74-04686 4A
FLOOD FORECASTING Power Law Dependence on Time of River	Spectra of the Temperature and Humidity Fluc-	FRANCE (MORVAN REGION)
Flood Decay and Its Relationship to Long-	tuations and of the Fluxes of Moisture and Sen- sible Heat in the Marine Boundary Layer,	Comparative Study, in 1966 and 1967, of Three
Term Discharge Frequency Distribution,	W74-04672 2E	Reservoirs in the Project of a Natural Park in
W74-04806 4A	Managements of the Turkulant Physic of Ma	the Morvan Region (In French),
FLOOD FREQUENCY	Measurements of the Turbulent Fluxes of Mo- mentum, Moisture and Sensible Heat Over the	W74-04815 50
Power Law Dependence on Time of River	Ocean,	FREEZE DRYING
Flood Decay and Its Relationship to Long-	W74-04673 2E	Scanning Electron Microscopy of Fixed
Term Discharge Frequency Distribution, W74-04806 4A	FLUID MECHANICS	Frozen, and Dried Protozoa, W74-04497 71
W/4-04000	Simulation of Horizontal Turbulent Diffusion	
FLOOD PLAINS	of Particles Under Waves, W74-04624 2J	FREEZING Thermal Disturbance Due to Channel Shifting
Hydraulic Performance of BridgesExcava- tions at Bridges,	W74-04624 2J	Mackenzie Delta, N.W.T., Canada,
W74-04482 8B	Analytical Methods of Solution of Conjugated	W74-04351 20
	Problems in Convective Heat Transfer, W74-04667 8B	Ecological Effects of River Flooding and
FLOODING Effects of Flooding and Draining and Their Al-	W/4-0400/	Forest Fires on Permafrost in the Taiga of
ternation on the Growth and Uptake of	Application of the Finite Element Method to	Alaska,
Nutrients by Rice (Oryza Sativa L., Indica Var.	Convection Heat Transfer Between Parallel Planes,	W74-04352 20
IR-8),	W74-04765 8B	Physics, Chemistry, and Mechanics of Frozen
W74-04826 3F		Ground: A Review,
FLOODPLAINS	FOOD CHAINS Vertical Distribution of Fishes Relative to	W74-04373 20
Effect of the Forest on the Displacement of the	Physical, Chemical and Biological Features in	The Unfrozen Water and the Apparent Specific
Desna River Bed and the Significance of this Effect on Forest Planting in the Floodplain, (In	Two Central Arizona Reservoirs,	Heat Capacity of Frozen Soils,
Russian),	W74-04474 5C	W74-04374 20
W74-04641 4A	FOOD PROCESSING INDUSTRY	Effect of Porosity on Amount of Soil Wate
FLOODS	Clarification Method of Polluted Water from	Transferred in a Freezing Silt,
Paleohydrology and Sedimentology of Lake	Paper Mills With Combination of Beer Effluent (In Japanese),	W74-04376 20
Missoula Flooding in Eastern Washington,	W74-04528 SD	Soil Freezing in Relation to Pore Water Pres
W74-04599 2E	PODACE BLANTS	sure and Temperature,
Response and Recovery of a Piedmont	FORAGE PLANTS Some New Data Concerning Zizania latifolia	W74-04381 20
Watershed from Tropical Storm Agnes, June	(Grisob.) STAPF AND ITS Resources in the	Experimental Pressure Studies on Frost Heav
1972, W74-04805 2J	Flood Plains of Lower Amur,	Mechanisms and the Growth-Fusion Behavio
W74-04805 2J	W74-04703 2I	of Ice, W74-04385
FLORIDA	FORECASTING	
Hydrogeologic Characteristics of the Surficial	A Review of Oceanographic Variables and	Effects of Salt Concentration Changes Durin
Aquifer in Northwest Hillsborough County, Florida,	Their Analyses and Predictions Over the Con- tinental Shelf.	Freezing on the Unfrozen Water Content or Porous Materials.
W74-04468 2F	W74-04329 2I.	W74-04802 20

FREQUENCY ANALYSIS	FROZEN SOILS	mal Tide ConditionsAppendix B: Calibration
An Approximation of the Wave Run-Up	The Unfrozen Water and the Apparent Specific	tests,
Frequency Distribution, W74-04740 2L	Heat Capacity of Frozen Soils, W74-04374 2C	W74-04573 8B
W74-04740 2L	W/4-043/4 2C	GARBAGE DUMPS
FROST	Mechanical Properties of Frozen Ground	Hydrologic and Geologic Considerations for
A Simulation Sensitivity Analysis of the Needle	Under High Pressure,	Solid-Waste Disposal in West-Central Florida,
Ice Growth Environment,	W74-04375 2C	W74-04605 5E
W74-04370 2C	Shock-Wave Studies of Ice and Two Frozen	GAS CHROMATOGRAPHY
FROST ACTION	Soils,	Analytical Techniques for the Determination of
A Simulation Sensitivity Analysis of the Needle	W74-04378 2C	Petroleum Contamination in Marine Organisms,
Ice Growth Environment,		W74-04594 5A
W74-04370 2C	Thaw Consolidation of Alaskan Silts and	
Physics, Chemistry, and Mechanics of Frozen	Granular Soils, W74-04379 2C	Thin-Layer and Gas-Chromatographic Deter-
Ground: A Review.	W/4-043/9	mination of Phenols Present in Water, (In Ger-
W74-04373 2C	Soil Freezing in Relation to Pore Water Pres-	man), W74-04684 5A
PROOF WEAVING	sure and Temperature,	77-01007
FROST HEAVING Experimental Pressure Studies on Frost Heave	W74-04381 2C	Diurnal Variation of Dissolved Inorganic Car-
Mechanisms and the Growth-Fusion Behavior	Sound and Shock Transmission in Frozen	bon and its Use in Estimating Primary Produc-
of Ice,	Soils,	tion and CO2 Invasion in Lake 227,
W74-04385 2C	W74-04383 2C	W74-04784 5A
0 1 10: 1 100 0 111: 1		Production of Epilithiphyton in Two Lakes of
Sample Disturbance and Thaw Consolidation of	Practical Extensions to a Theory of Consolida-	the Experimental Lakes Area, Northwestern
a Deep Sand Permafrost, W74-04387 2C	tion for Thawing Soils,	Ontario,
W/4-0438/	W74-04384 2C	W74-04787 50
Pore Water and Heaving Pressures Developed	Experimental Pressure Studies on Frost Heave	
in Partially Frozen Soils,	Mechanisms and the Growth-Fusion Behavior	A Syringe Gas-Stripping Procedure for Gas
W74-04389 2C	of Ice,	Chromatographic Determination of Dissolved
Some Passive Methods of Controlling	W74-04385 2C	Inorganic and Organic Carbon in Fresh Water and Carbonates in Sediments,
Geocryological Conditions in Roadway Con-	Triaxial and Creep Tests on Frozen Ottawa	W74-04788 5A
struction,	Sand,	
W74-04406 2C	W74-04386 2C	GASES
Corps of Engineers Technology Related to		Land Disposal of Waste Gases: 1. Flow Analy
Design of Pavements in Areas of Permafrost,	Viscoelastic Properties of Frozen Soil Under	sis of Gas Injection Systems,
W74-04414 4C	Vibratory Loads, W74-04388 8D	W74-04479 5E
	W74-04388 8D	Land Disposal of Waste Gases: II. Gas Flow
FROTH FLOTATION	Pore Water and Heaving Pressures Developed	from Buried Pipes,
Screening Aerator Concentrator,	in Partially Frozen Soils,	W74-04480 5E
W74-04712 5D	W74-04389 2C	
FROZEN GROUND	Effects of Salt Concentration Changes During	GENETIC TRANSMISSION
Studies at the Timmins 4 Permafrost Experi-	Freezing on the Unfrozen Water Content of	New Contributions to Biological Study of Genetic Transmission of Resistance to Drynes:
mental Site,	Porous Materials,	in Double Hybrids of Zea Mays,
W74-04363 2C	W74-04802 2C	W74-04833 31
Origin, Composition, and Structure of Perenni-	HUEL BERROGEROUNG	
ally Frozen Ground and Ground Ice: A Review,	FUEL REPROCESSING Disposal of Radioactive Wastes,	GEOCHEMISTRY
W74-04366 2C	W74-04445 5D	Geochemistry of Permafrost and Quaternary
	W/4-0443	Stratigraphy,
Thermokarst Development, Banks Island, Western Canadian Arctic,	Environmental Surveillance for Fuel Fabrica-	W74-04364 20
W74-04368 2C	tion Plants,	GEOLOGIC HISTORY
177-04300	W74-04451 5B	History of the Formation of the Coasts of
Physics, Chemistry, and Mechanics of Frozen	Industry Awaits Solutions to Problems of High-	Kara-Bogaz-Gol,
Ground: A Review,	Level Radioactive-Waste Management,	W74-04427 2
W74-04373 2C	W74-04457 5D	Some Data on the Post-Glacial Transgression
Effect of Porosity on Amount of Soil Water		of the Bering Sea,
Transferred in a Freezing Silt,	FUELS	W74-04431 2
W74-04376 2C	Breeder Reactors: Power for the Future, W74-04656 8C	
Mechanical Properties of Rocks at Low Tem-	W 74-04030 8C	GEOLOGIC MAPPING
peratures.	FUNDING (ALLOCATION)	The Need of Geological Investigations for the
W74-04380 2C	Allocation of Funding for Wastewater Treat-	Development of the Ground Water Resource
	ment Facilities,	of the Republic of Korea, W74-04466 41
In Situ Physicomechanical Properties of Per-	W74-04562 5D	W74-04466 41
mafrost Using Geophysical Techniques,	FUNGUS DISEASES (CROPS)	GEOMORPHOLOGY
W74-04399 2C	Rainfed Rice in Southern Senegal: Evaluation	Growth of Patterned Ground in Victoria Land
Potential Use of Airborne Dual-Channel In-	of Three Years' Experimentation (1966-1969),	Antarctica,
frared Scanning to Detect Massive Ice in Per-	(In French),	W74-04367 26
mafrost,	W74-04829 3F	Topology of River Systems and Hydrographi
W74-04403 7B	GALVESTON BAY	Indicator Studies (Topologiya rechnykh sister
Stability of an Underground Room in Frozen	Galveston Bay Hurricane Surge Study: Report	i gidrograficheskiye indikatsionnyye iss
Gravel,	2. Effects of Proposed Barriers on Tides, Cur-	ledovaniya),
W74-04418 2C	rents, Salinities, and Dye Dispersion for Nor-	W74-04578 24

GEOMORPHOLOGY

Slope Development on a Mississippi River	GHANA (VOLTA LAKE)	Groundwater Investigations in Permafrost Re-
Bluff in Historic Time, W74-04585 2J	Benthic Fauna of a Tropical Man-Made Lake (Volta Lake, Ghana 1965-1968), W74-04636 2H	gions of North America: A Review, W74-04391 2F
GEOPHYSICS	W /4-04030 ZH	A Groundwater Supply for an Oil Camp Near
Geophysical Identification of Frozen and Un- frozen Ground, Antarctica,	GILLS Mercury Uptake and Ion Distribution in Gills	Prudhoe Bay, Arctic Alaska, W74-04396 2F
W74-04360 2C	of Rainbow Trout (Salmo gairdneri): Tissue Scans with an Electron Microprobe,	Southwestern Groundwater Law: A Textual and Bibliographic Interpretation,
Electromagnetic Probing of Permafrost, W74-04400 2C	W74-04778 5A	W74-04460 4B
W/4-04400	GLACIAL DRIFT	The Need of Control of Investigation for the
GEORGIA Multipurpose Reservoirs and Urban Develop-	Quickelays as Products of Glacial Action: A New Approach to Their Nature, Geology, Dis-	The Need of Geological Investigations for the Development of the Ground Water Resources of the Republic of Korea,
ment, W74-04319 6B	tribution and Geotechnical Properties, W74-04590 2G	W74-04466 4B
		Prediction of the 1972 Managua, Nicaragua,
Beach Profiles of a Georgia Barrier Island, W74-04736 2J	GLACIERS Accumulation on the Devon Island Ice Cap, Northwest Territories, Canada,	Earthquake from Groundwater Changes, In- ferred Probability of Earthquakes in the City of
Eolian Cross-Bedding in the Beach Dune En-	W74-04325 2C	Managua, Nicaragua, during the Summer of 1973.
vironment, Sapelo Island, Georgia,	De die Donth Sounding on Mainhau and Bornes	W74-04467 2F
W74-04737 2J	Radio Depth-Sounding on Meighen and Barnes Ice Caps, Arctic Canada,	Embertion of the Count Water Supply of
High-Angle Beach Stratification, Sapelo Island,	W74-04571 2C	Evaluation of the Ground-Water Supply at Eight Sites in Glacier National Park,
Georgia,	CP.IN.	Northwestern Montana,
W74-04738 2J	GRAIN Role of Soil Conditions in the Development of	W74-04469 2F
GEOTHERMAL POWER	Moths, (In Russian),	Possible Application of Remote Sensing for
Ground Water and the Geothermal Resource.	W74-04640 3F	Underground Water Exploration in Turkey,
W74-04586 4B	GRASSES	W74-04568 7B
GEOTHERMAL STUDIES	Production Ability of Legumes, Grasses and	Groundwater Investigation and Management in
Deep Temperature Observations in the Canadi-	Their Mixtures in Hill-Land Regions,	Iran,
an North,	W74-04694 4A	W74-04569 7B
W74-04349 2C	GRASSLANDS	Ground Water and the Geothermal Resource.
Ground Water and the Geothermal Resource. W74-04586 4B	Effect of Long-Term Application of Variously High Rates of Nutrients on Natural Grassland	W74-04586 4B
	Swards,	Availability of Ground Water in the Winnsboro
Economic Power from Geothermal Heat, W74-04766 4B	W74-04693 • 4A	Area, Louisiana, W74-04596 4B
W74-04766 4B	GRAVELS	
GERMANY	Stability of an Underground Room in Frozen	GROUNDWATER MANAGEMENT Economic Aspects of Ground Water Resources
Modern Waste Water Treatment and	Gravel, W74-04418 2C	and Replacement Flows in Semiarid Agricul-
Processing Techniques in the Paper and Board Industry (Moderne Abwasseraufbereitungs-und	W/4-04416	tural Areas,
Verfahrenstechnik in der Papier- und Kartonin-	GRAVITY WAVES	W74-04563 4B
dustrie),	On Non-Saturated Breakers and the Wave Run- Up,	GROUNDWATER MOVEMENT
W74-04517 5D	W74-04742 2L	Effect of Porosity on Amount of Soil Water
Ecological Investigations of Ponds with Special	Wasses and Tides Name the Chara	Transferred in a Freezing Silt, W74-04376 2C
Regard to the Consequences of Water Pollution	Waves and Tides Near the Shore, W74-04758 2L	
by Oil, (In German), W74-04635 5C		Hydrogeologic Characteristics of the Surficial Aquifer in Northwest Hillsborough County,
	Propagation of a Finite-Amplitude Surface	Florida,
GERMANY (BERLIN AREA)	Wave With Allowance for Random Irregulari- ties of the Bottom,	W74-04468 2F
Problem of Isolating Salmonella from Surface Waters Exemplified by Long-Term Studies in	W74-04841 2J	A Proposal for the Investigation of Possible
the Berlin Area, Capital of the German	GREAT LAKES	Ground-Water Contamination in the Bangor
Democratic Republic, (In German),	Littoral Transport in the Great Lakes,	Area, Kitsap County, Washington, W74-04491 5B
W74-04835 5A	W74-04334 2J	W74-04491 5B
GERMANY (FREIBURG-IM-BREISGRAW)	Modification of Nearshore Currents by Coastal	GROUNDWATER RESOURCES
Chironomidae (Diptera) from the Area of	Structures,	Reconnaissance of the Ground-Water Resources of Cimarron County, Oklahoma,
Freiburg in Breisgau (with Special Consideration of the Genus Chironomus), (In German),	W74-04341 8B	W74-04495 4B
W74-04678 2H	GREEN FODDER Effect of Light Intensity on the Quality and	GROWTH RATES
GERMANY (LAKE OF CONSTANCE)	Feeding Effectiveness of Green Fodder, (In	Managing Growth in a Fragile Environment: Problems of the Rocky Mountain States,
The Relation Between Phytoplankton and Phosphate in the Lake of Constance, (In Ger-	Russian), W74-04821 3F	W74-04505 6D
man),		Effects of Temperature on Developing Meristic
W74-04637 5C	GREENLAND Thermal Begins in an Arctic Forthfill Dom	Structures of Smallmouth Bass, Micropterus
GERMANY (RHINE RIVER)	Thermal Regime in an Arctic Earthfill Dam, W74-04410 8D	dolomieui Lacepede, W74-04663 50
Principles of Evaluating Effects of Thermal		
Discharges on Surface Waters (Grundlagen fur die Beurteilung der Warmebelastungen von	GROUNDWATER Problems in the Origin of Massive Icy Reds	Temperature Requirements for Embryos and
Gewassern).	Problems in the Origin of Massive Icy Beds, Western Arctic, Canada,	Larvae of the Northern Pike, Esox lucius (Linnaeus),
W74-04764 5C	W74-04369 2C	W74-04670 50

CROWETT CEACEC	HAWAII	Application of the Finite Element Method to
GROWTH STAGES		Convection Heat Transfer Between Parallel
Feeding of Juvenile Carp Cyprinus carpio L. in	Baseline Quality Data for Kalihi Stream, W74-04309 5B	Planes,
the Arakum Bodies of Water (Delta of the	W74-04309 5B	W74-04765 8B
Terek River) at Early Developmental Stages, (In Russian).	HEAT	W /4-04/05
(In Russian), W74-04649 2L	Measurements of the Turbulent Fluxes of Mo-	Economic Power from Geothermal Heat,
W/4-04049 2L	mentum, Moisture and Sensible Heat Over the	W74-04766 4B
Influence of Soil Moisture Conditions on	Ocean.	
Growth and Development of the Potato	W74-04673 2E	HEATED PIPELINES
Solanum tuberosum L.,		Permafrost Protection for Pipelines,
W74-04687 3F	HEAT BUDGET	W74-04415 2C
	Detailed Time Variations in Mean Temperature	HEATED WATER
GUDGEON	and Heat Content of Some Madison Lakes,	
Morphology and Life Style of the Turkestan	W74-04659 2H	Buoyancy Spread of Waste Water in Coastal
Gudgeon Gobio gobio lepidolaemus Kessler in		Regions, W74-04630 5B
Waters of the Sukhan-Darya Basin, (In Rus-	Principles of Evaluating Effects of Thermal	W 74-04030 3B
sian),	Discharges on Surface Waters (Grundlagen fur	HECATE MODEL
W74-04650 8I	die Beurteilung der Warmebelastungen von	Reproduction of Estuarine Structure and Cur-
GULF OF MEXICO	Gewassern).	rent Observation Techniques in the Hecate
Wave Forecasting Relationships for the Gulf of	W74-04764 5C	Model,
Mexico,	TIPAT DECHARGED	W74-04724 2L
W74-04729 2E	HEAT EXCHANGERS	
1111112	An Analytical Study of a Coiled-Pipe Heat	HETEROTROPHIC BACTERIA
GULFS	Sink,	Heterotrophic Utilization of Sucrose in an Ar-
History of the Formation of the Coasts of	W74-04589 8B	tificially Enriched Lake,
Kara-Bogaz-Gol,	Economic Power from Geothermal Heat,	W74-04781 5C
W74-04427 2J	•	TO THE CASE OF THE
	W74-04766 4B	HINDCASTING
HALIBUT	HEAT FLOW	Wave Forecasting Relationships for the Gulf of
Analysis of Trace Elements, Phosphorus and	Thermal Conditions in PermafrostA Review	Mexico, W74-04729 2E
Sulphur, in the Lipid and the Non-Lipid Phase	of North American Literature,	W74-04729 2E
of Halibut (Hippoglossus hippoglossus) and	W74-04347 2C	HINDCASTS
Tunny (Thunnus thynnus),	11/1-0154/	The Effect of Waves on the Profile of a Natu-
W74-04770 5A	A General Solution for the Two-Dimensional,	ral Beach.
HARRORE	Transient Heat Conduction Problem in Per-	W74-04620 2J
HARBORS	mafrost, Using Implicit, Finite Difference	
Modification of Nearshore Currents by Coastal	Methods.	HOUSING
Structures, W74-04341 8B	W74-04350 2C	Housing and Planning References.
W /4-04341 6B		W74-04511 3D
Currents at Harbor Beach, Michigan,	Thermal Disturbance Due to Channel Shifting,	
W74-04342 5B	Mackenzie Delta, N.W.T., Canada,	HUMIDITY
	W74-04351 2C	Water in Wood,
Environmental Monitoring and Disposal of		W74-04545 21
Radioactive Wastes from U.S. Naval Nuclear-	HEAT FLUX	Spectra of the Temperature and Humidity Fluc-
Powered Ships and Their Support Facilities,	Application of the Finite Element Method to	tuations and of the Fluxes of Moisture and Sen-
1972,	Convection Heat Transfer Between Parallel	sible Heat in the Marine Boundary Layer,
W74-04441 5B	Planes,	W74-04672 2E
61 . P W . G 6. I P .	W74-04765 8B	W/4-040/2
Galveston Bay Hurricane Surge Study: Report	WEAT CINIC	HUMUS
2. Effects of Proposed Barriers on Tides, Cur-	HEAT SINKS	Influences of Soil Density, Clay Silt and
rents, Salinities, and Dye Dispersion for Nor-	An Analytical Study of a Coiled-Pipe Heat	Humus Content on Measurements of Soil
mal Tide Conditions-Appendix B: Calibration	Sink,	Water by Neutron Gauges, (In German),
tests,	W74-04589 8B	W74-04556 2G
W74-04573 8B	HEAT STRESS	
Wave Action and Breakwater Design, Hamlin	Effect of Light on Vulnerability of Heat-	HUNGARY
Beach Harbor, New York,	Stressed Sockeye Salmon to Predation by Coho	Water Problems of the Tisza River in Hungary
W74-04588 8B	Salmon,	and Cooperation Among Tisza Basin Countries
W. 1 0 13 0 5	W74-04671 5C	in the Field of Water Management (Vodnyye
Waves Off Benghazi Harbour - Libya,	W/4-040/1	problemy reki Tisy v Vengrii i sotrudnichestvo
W74-04608 2L	HEAT TRANSFER	stran basseyna Tisy v oblasti vodnogo khoz-
	A General Solution for the Two-Dimensional,	vayst va),
Hydraulic Model Experiment on the Duffusion	Transient Heat Conduction Problem in Per-	W74-04574 4A
Due to the Coastal Current,	mafrost, Using Implicit, Finite Difference	THE PART OF A PERSON
W74-04628 5B	Methods,	HUNGARY (LAKE BALATON)
	W74-04350 2C	Distribution of Organic Matter and Bacteria in
Feasibility Study for a Surge-Action Model of	1177-04330	the Upper Layer of Bottom Deposit of Lake
Monterey Harbor, California,	An Analytical Study of a Coiled-Pipe Heat	Balaton,
W74-04721 2L	Sink,	W74-04839 5B
Effect of Entrance on Seiche Motion in Ocean	W74-04589 8B	HURRICANES
Ports,		Hurricane Storm Surge Considered as a
W74-04743 2L	Convective Heat Transfer to Water Containing	Resonance Phenomenon.
2L	Bubbles: Enhancement not Dependent on Ther-	W74-04332 2L
Investigation of Seiche Activity in West Coast	mocapillarity,	
Harbors,	W74-04664 8B	Hurricane Tide Prediction for New York Bay,
W74-04744 2L		W74-04343 2L
	Analytical Methods of Solution of Conjugated	
The Analysis of Harbor and Estuary Systems,	Problems in Convective Heat Transfer,	Galveston Bay Hurricane Surge Study: Report
W74-04745 2L	W74-04667 8B	2. Effects of Proposed Barriers on Tides, Cur-

HURRICANES

C. F. Min. and Day Dispussion for Non	Selection: Bost 2 A Mathed of Horondove and	HUCIPNIC MPACIBES
rents, Salinities, and Dye Dispersion for Nor- mal Tide Conditions-Appendix B: Calibration	Selection: Part 2. A Method of Hazardous and Toxic Waste Disposal,	HYGIENIC MEASURES Hygienic Efficiency of Measures for Protecting
tests,	W74-04592 5E	Surface Waters in Uzbek SSR, (In Russian),
W74-04573 8B	Hydrologic and Geologic Considerations for	W74-04838 5F
Drastic Beach Changes in a Low-Energy En-	Solid-Waste Disposal in West-Central Florida,	HYGROSCOPIC WATER
vironment Caused by Hurricane Betsy,	W74-04605 5E	Water in Wood,
W74-04756 2J	Mississippian Aquifer of Iowa,	W74-04545 2I
Response and Recovery of a Piedmont	W74-04843 7C	HYPERBOLIC WAVES
Watershed from Tropical Storm Agnes, June	HYDROGRAPHS	Hyperbolic Waves and Their Shoaling,
1972, W74-04805 2J	A Study on the Accuracy of Runoff Analysis	W74-04611 2E
	for Pumping Drainage in Paddy Field Area (In	HYPOCHLORINATION
HYBRIDS (CORN)	Japanese), W74-04811 4A	Hypochlorination of Polluted Storm-Water
New Contributions to Biological Study of Genetic Transmission of Resistance to Dryness		Pumpage at New Orleans,
in Double Hybrids of Zea Mays,	HYDROGRAPHY Topology of River Systems and Hydrographic	W74-04676 5D
W74-04833 3F	Indicator Studies (Topologiya rechnykh sistem	ICE
HYDRAULIC MODELS	i gidrograficheskiye indikatsionnyye iss-	Thermokarst Development, Banks Island,
The Relationship Between Wave Action and	ledovaniya),	Western Canadian Arctic, W74-04368 2C
Beach Profile Characteristics, W74-04331 2J	W74-04578 2A	
W74-04331 2J	HYDROLOGIC DATA	Problems in the Origin of Massive Icy Beds,
A Laboratory Investigation of Free Surface	Mathematical Modeling of Stream Storage Potential,	Western Arctic, Canada, W74-04369 2C
Flows Over Wavy Beds, W74-04477 8B	W74-04305 2E	
		Groundwater Pore Pressures Adjacent to Sub-
Galveston Bay Hurricane Surge Study: Report	Linear Systems Technique Applied to Hydrologic Data Analysis and Instrument	arctic Streams, W74-04393 2C
Effects of Proposed Barriers on Tides, Cur- rents, Salinities, and Dye Dispersion for Nor-	Evaluation: A Case Study on Data from the	
mal Tide ConditionsAppendix B: Calibration	Alice Springs Area,	Potential Use of Airborne Dual-Channel In-
tests,	W74-04470 2A	frared Scanning to Detect Massive Ice in Per- mafrost,
W74-04573 8B	Quantity and Chemical Quality of Low Flow in	W74-04403 7B
Wave Action and Breakwater Design, Hamlin	the East Fork San Jacinto and West Fork San	Control of Cultural Ining
Beach Harbor, New York,	Jacinto Rivers near Houston, Texas, June 24, 26, 1969.	Control of Culvert Icing, W74-04411 4C
W74-04588 8B	W74-04481 5B	
Study of Beach Widening By the Perched	Evaluation and Simulation of Chemical-Quality	ICE BREAKUP
Beach Concept, Santa Monica Bay, California, W74-04603	Data for Five Montana Sampling Stations,	The Nature of the Seawater-Freshwater Inter- face During Breakup in the Colville River
W74-04603 8B	W74-04484 2K	Delta, Alaska,
Hydraulic Model Experiment on the Duffusion	Ground-Water Data for Harris County, Texas:	W74-04397 2C
Due to the Coastal Current, W74-04628 5B	Volume I. Drillers' Logs of Wells, 1905-71.	ICE CAPS
-	W74-04602 4B	Accumulation on the Devon Island Ice Cap,
Use of a Computational Model for Two-Dimensional Tidal Flow,	Water Quality Records for the Hubbard Creek	Northwest Territories, Canada,
W74-04631 2L	Watershed, Texas, October 1969-September	W74-04325 2C
	1972, W74-04606 5B	ICE CONTROL
HYDROGEN ION CONCENTRATION Water Quality Requirements of Aquatic In-		Control of Culvert Icing,
sects,	Characteristics of Streamflow at Gaging Sta-	W74-04411 4C
W74-04551 5C	tions in the Loup River Basin, Nebraska, W74-04794 2E	ICE LOADS
HYDROGEOLOGY		Ice Engineering-Summary of Elastic Proper-
The Need of Geological Investigations for the	Surface- and Ground-Water Conditions During 1959-61 in a Part of Flett Creek Basin, Tacoma,	ties Research and Introduction to Viscoelastic and Nonlinear Analysis of Saline Ice,
Development of the Ground Water Resources	Washington,	W74-04793 2C
of the Republic of Korea, W74-04466 4B	W74-04796 2E	ICE WEDGES
	Hydrologic Data for Small Rural Catchments in	ICE WEDGES Growth of Patterned Ground in Victoria Land,
Hydrogeologic Characteristics of the Surficial	Australia, 1973,	Antarctica,
Aquifer in Northwest Hillsborough County, Florida,	W74-04842 2E	W74-04367 2C
W74-04468 2F	Mississippian Aquifer of Iowa,	ICELAND
Reconnaissance of the Ground-Water	W74-04843 7C	Concerning Large-Scale Cultivation of Thermo-
Resources of Cimarron County, Oklahoma,	HYDROLOGICAL CYCLE	philic Cosmopolitan Mastigocladus Laminousus
W74-04495 4B	Urbanization: A Hydrological Headache,	Cohn (Cyanophyta) in Icelandic Hot Springs, W74-04486 21
Possible Application of Remote Sensing for	W74-04642 4C	
Underground Water Exploration in Turkey,	HYDROLOGY	IDAHO A Radiological Environmental Survey at EBR-
W74-04568 7B	Cento Seminar on the Application of Remote Sensors in the Determination of natural	A Radiological Environmental Survey at EBR- II,
Groundwater Investigation and Management in	Resources.	W74-04455 5B
Iran,	W74-04567 7B	Suspended and Bedload Sediment Transport in
W74-04569 7B	Operational and Experimental Remote Sensing	the Snake and Clearwater Rivers in the Vicinity
Hydrogeologic Considerations in Solid Waste	in Hydrology,	of Lewiston, Idaho,
Storage in Iowa: Part 1. Sanitary Landfill Site	W74-04570 7B	W74-04846 2J

IRON MANGANESE MICROORGANISMS

IMINES Determination of Microgram Quantities of Polyethylene Polyamines in Water, (In Rus-	Apparatus for Treating Industrial and Domestic Waste Waters, W74-04707 5D	The Use of Polyurethane Foam Plastics in the Construction of Expedient Roads on Per- mafrost in Central Alaska,
sian), W74-04701 5A	INDUSTRIAL WATER	W74-04421 8G
IMPAIRED WATER USE Social, Economic, Environmental, and Techni-	Catalytic Oxidation and Thermal Treatment of Waste Waters (Kataliticheskoe okislenie i ter- micheskoe obezvrezhivanie stochnykh vod), W74-04537 5D	INTERNAL WAVES Reproduction of Estuarine Structure and Cur- rent Observation Techniques in the Hecate
cal Factors Influencing Water Reuse, W74-04317 5D		Model, W74-04724 2L
IMPOUNDMENTS Multipurpose Reservoirs and Urban Develop-	INFILTRATION Soil Crusting Related to Sprinkler Intensity, W74-04560 3F	INTERNATIONAL COMMISSIONS International Decade of Ocean Exploration.
ment, W74-04319 6B	INKS	W74-04473 6E
INCINERATION	Water Pollution in the Netherlands, W74-04536 5B	INTERNATIONAL DECADE OF OCEAN EXPLORATION
Catalytic Oxidation and Thermal Treatment of Waste Waters (Kataliticheskoe okislenie i ter- micheskoe obezvrezhivanie stochnykh vod),	INLETS (WATERWAYS) Mechanical Bypassing of Littoral Drift at In-	International Decade of Ocean Exploration. W74-04473 6E
W74-04537 5D	lets, W74-04337 2L	INTERNATIONAL WATERS
Waste Automotive Lubricating Oil as a Mu-	Certain Structural and Developmental Coastal	International Decade of Ocean Exploration. W74-04473
nicipal Incinerator Fuel, W74-04549 5D	Features in the South of the Maritime Territo-	TANGGOOD INCOMA BUT 1971
	ry, W74-04432 2J	INVISCID INSTABILITY On the Stability of Laminar Plumes: Some Nu-
INDIA Sediment Movement at Indian Ports,		merical Solutions and Experiments,
W74-04345 2L	Application of Fluorescent Coated Sand in Lit- toral Drift and Inlet Studies,	W74-04662 5B
Characteristics of Pulp and Paper Mill Wastes	W74-04616 2L	ION EXCHANGE Aspects of Colour Removal from Pulp and
and ISI Standards, W74-04530 5B	INSTITUTIONAL CONSTRAINTS Institutional Framework Affecting the Use of	Paper Mill Effluents, W74-04514 5D
Low Cost Methods for Treating Pulp and Paper Mill Effluents,	Inland Wetlands in Massachusetts, W74-04462 4A	ION TRANSPORT
W74-04531 5D	What Do We Mean by Metropolitan Water	Ionic Mobility in Permafrost, W74-04382 2C
INDIA (RAJASTHAN CANAL PROJECT) The Rajasthan Canal Area: A Settlement Struc-	Management Institutions., W74-04498 6E	IONIC MOBILITY
ture,	INSTITUTIONAL RESTRAINTS	Ionic Mobility in Permafrost,
W74-04499 6D	A Study of Water Institutions in Utah and Their Influence on the Planning, Developing,	W74-04382 2C
INDIANA A Report on the Limnology of Monroe Reservoir, Indiana,	and Managing of Water Resources, W74-04316 6E	IONIZATION Mass Spectrometry and Inhomogeneous Ion
W74-04792 2H	INSTITUTIONS	Optics, W74-04475 5A
INDIRECT REUSE	Sociocultural Impact of Reservoirs on Local Government Institutions, Anthropological	IOWA
An Assessment of the Use of Potomac Estuary Waters and AWT Effluents for Emergency	Analysis of Social and Cultural Benefits and Costs from Stream Control MeasuresPhase 4,	Hydrogeologic Considerations in Solid Waste Storage in Iowa: Part 1. Sanitary Landfill Site
Water Supply, W74-04506 5D	W74-04311 6B	Selection: Part 2. A Method of Hazardous and Toxic Waste Disposal,
INDUSTRIAL WASTES	A Study of Water Institutions in Utah and	W74-04592 5E
Mechanical Clarification of Industrial Waste Waters (Mechanische Klaerung von Indus-	Their Influence on the Planning, Developing, and Managing of Water Resources, W74-04316 6E	Trickling Filter-Activated Sludge Combinations for Domestic Wastewater Treatment,
trieabwaessern). W74-04515 5D	What Do We Mean by Metropolitan Water	W74-04798 5D
Clarification Method of Polluted Water from	Management Institutions., W74-04498 6E	Mississippian Aquifer of Iowa, W74-04843 7C
Paper Mills With Combination of Beer Effluent (In Japanese), W74-04528 5D	INSTRUMENTATION Evaluation of in Situ Creep Properties of	IRAN
Hydrogen Peroxide for Industrial Pollution	Frozen Soils with the Pressuremeter, W74-04377 2C	Groundwater Investigation and Management in Iran,
Control, W74-04532 5D	Linear Systems Technique Applied to	W74-04569 7B
	Hydrologic Data Analysis and Instrument	IRON 200 MGD Activated Sludge Plant Removes
Water Pollution in the Netherlands, W74-04536 5B	Evaluation: A Case Study on Data from the Alice Springs Area,	Phosphorus by Pickle Liquor,
Some Neglected Sources of Water Pollution	W74-04470 2A	
(Nedostatochno uchityvayemyye istochniki zagryazneniya prirodnykh vod),	Nucleonic Sediment Concentration Gauge - Comparison of Transmission and Scattering	Availability of Ground Water in the Winnsboro Area, Louisiana,
W74-04579 5B	Modes,	W74-04596 4B
Processes for Reducing the Organic-Carbon Content of Water Contaminated with Organic	W74-04774 2J INSULATION	IRON MANGANESE MICROORGANISMS Overgrowth of Ooze Iron-Manganese Microor-
Compounds by Continuous Countercurrent Multistage Treatment with Activated Carbon, W74-04704 5D	Control of Permafrost Degradation Beneath a Roadway by Subgrade Insulation, W74-04409 4C	ganisms Studied by Electron Microscopy, (In Russian), W74-04558 5A

IRRIGATION

IRRIGATION Application of Dynamic Programming in Mar-	IRRIGATION WATER Economic Aspects of Ground Water Resources	A History and Preliminary Inventory Report on the Kentucky Radioactive Waste Disposal Site, W74-04442 5B
kov Chains to the Evaluation of Water Quality in Irrigation,	and Replacement Flows in Semiarid Agricul- tural Areas,	
W74-04561 3C	W74-04563 4B	A Preliminary Survey of the Possible Con-
Results of Trials with Tobacco and Cotton	ISLAND Field Measurements of Swell Off the Island of	tamination of Lake Nakuru in Kenya with Some Metals and Chlorinated Hydrocarbon
Rotations Under Irrigation, (In Bulgarian), W74-04825 3F	Aruba,	Pesticides,
A Study on the Depth of Basic Tillage and Soil	W74-04723 2E	W74-04547 5C
Fertilization for Maize Grown Under Irrigation,	ISOLATION	KERATELLA-COCHLEARIS
(In Bulgarian), W74-04828 3F	Relative Efficiency of Cell Cultures for Detec- tion of Viruses,	Morphological Variation of Keratella cochlearis (Gosse) (Rotatoria) in Several Masurian Lakes
Effect of Fertilizers and Irrigation Conditions	W74-04767 5A	of Different Trophic Level, W74-04696 5C
on Yield, Chemical Composition, Baking Quali- ties of Winter Wheat Grain of Bezostaya 1 Cul-	ISOTOPE FRACTIONATION Mass Spectrometry and Inhomogeneous Ion	KINETICS Movements of Phosphorus Between its Biologi-
tivar, (In Russian), W74-04830 3F	Optics, W74-04475 5A	cally Important Forms in Lake Water,
Productivity and Grain Qualities of Certain	ISRAEL (LAKE KINNERET)	W74-04783 5B
Newly Developed Native and Foreign Wheat Varieties Grown Under Irrigation, (In Bulgari-	Chemical Ecology: Evidence for Phosphate as the Only Factor Limiting Algal Growth in Lake	LABOR Cost-Benefit Analysis of Irrigation Projects in Northeastern Brazil,
an), W74-04832 3F	Kinneret, W74-04685 5C	W74-04565 3F
		LABORATORY EQUIPMENT
IRRIGATION CANALS The Rajasthan Canal Area: A Settlement Struc-	JAPAN Strontium-90 and Cesium-137 Levels in Soils of	Apparatus for Recording Avoidance Move-
ture,	Various Types at Niigata Prefecture, Japan,	ments of Fish, W74-04776 5A
W74-04499 6D	W74-04453 5B	
IRRIGATION DISTRICTS A Study of Water Institutions in Utah and	Field Investigation Practices of Coastal Studies in Japan,	Laboratory Study of Self-Sealing Limestone
Their Influence on the Planning, Developing,	W74-04625 2L	Plugs for Mine Openings, W74-04559 5G
and Managing of Water Resources, W74-04316 6E	Suspended Sediment Due to Wave Action, W74-04747 2J	Laboratory Studies of the Accommodation of
The Rajasthan Canal Area: A Settlement Struc-		Some Crude and Residual Fuel Oils in Sea Water,
ture,	Rhythmic Pattern of Longshore Bars Related to Sediment Characteristics,	W74-04775 5B
W74-04499 6D	W74-04750 2J	LACTATES
IRRIGATION EFFICIENCY	JAPAN (GO-NO-IKE LAKE)	Effects of Cadmium and Copper on the Oxida-
Application of Regression Analysis to Estima- tion of the Efficiency of Water Use in Irriga-	Ecological Characteristics of Go-No-Ike Lake, W74-04638 5C	tion of Lactate by Rainbow Trout (Salmo gaird- nert) Gills,
tion (Opyt primeneniya regressionnogo analiza		W74-04780 5C
k otsenke effektivnosti ispol'zovaniya vody pri oroshenii),	JAPAN (KASHIMA HARBOR) Hydraulic Model Experiment on the Duffusion	LAGOONS
W74-04580 3F	Due to the Coastal Current, W74-04628 5B	Dynamics and Morphology of Sea Coasts. W74-04425 2J
IRRIGATION (FURROW) Water Consumption and Biological Coefficient		Morphology and Evolution of aLagoon Coast
of Furrow and Sprinkler Irrigated Cotton, (In	JETS Zone of Flow Establishment for Round	on Sakhalin,
Bulgarian),	Buoyant Jets,	W74-04433 2J
W74-04824 3F	W74-04657 5B	Boise Cascade Paper Mill and St. Helens Share
IRRIGATION PRACTICES A Simulation Model for Evaluating Irrigation	On the Stability of Laminar Plumes: Some Nu- merical Solutions and Experiments,	Treatment Lagoon. W74-04535 5D
Management Practices, W74-04564 3F	W74-04662 5B	LAKE BAIKAL Subglacial Development of Chlorella in Baikal,
Application of Regression Analysis to Estima-	JUDICIAL DECISIONS	(In Russian),
tion of the Efficiency of Water Use in Irriga- tion (Opyt primeneniya regressionnogo analiza	Southwestern Groundwater Law: A Textual and Bibliographic Interpretation, W74-04460 4B	W74-04647 2H
k otsenke effektivnosti ispol'zovaniya vody pri		LAKE BORULLUS (A Fishery Survey Carried out at Lake Borullus,
oroshenii), W74-04580 3F	KALIHI STREAM (H Baseline Quality Data for Kalihi Stream,	A. R. E., in the Spring of 1971, (In Czech), W74-04643 2H
IRRIGATION PROGRAMS	W74-04309 5B	LAKE ERIE
The Rajasthan Canal Area: A Settlement Struc-	KENTUCKY	Chemical Quality of Streams, Allegheny River
ture, W74-04499 6D	A Detailed Investigation of the Sociological, Economic, and Ecological Aspects of Proposed	Basin and Part of the Lake Erie Basin, New York,
Cost-Benefit Analysis of Irrigation Projects in	Reservoir Sites in the Salt River Basin of Ken- tucky,	W74-04593 2K
Northeastern Brazil,	W74-04310 2A	LAKE GEORGE (NY)
W74-04565 3F	Sociocultural Impact of Reservoirs on Local	A Field Study of Langmuir Circulations, W74-04845 2H
IRRIGATION SYSTEMS	Government Institutions, Anthropological	LAKE HURON
A Simulation Model for Evaluating Irrigation Management Practices,	Analysis of Social and Cultural Benefits and Costs from Stream Control MeasuresPhase 4,	Currents at Harbor Beach, Michigan,
W74-04564 3F	W74-04311 6B	W74-04342 5B

LAKE MENDOTA (WIS) Detailed Time Variations in Mean Temperature	Con the Stability of Laminar Plumes: Some Nu-	LANGMUIR CIRCULATION Wave Interaction and Langmuir Circulations,
and Heat Content of Some Madison Lakes, W74-04659 2H	merical Solutions and Experiments, W74-04662 5B	W74-04844 2H
LAKE MICHIGAN	Application of the Finite Element Method to	A Field Study of Langmuir Circulations,
Aerial Radiological Measuring Survey of the	Convection Heat Transfer Between Parallel	W74-04845 2H
Area Surrounding the Point Beach Nuclear	Planes,	LEAD
Plant, Two Creeks, Wisconsin, August 16 and 17, 1970.	W74-04765 8B	Polluted Snow in Southern Norway During the
W74-04449 5A	LAMINAR PLUMES	Winters 1968-1971,
	On the Stability of Laminar Plumes: Some Nu-	W74-04652 5B
A Numerical Model for Determining Integral Primary Production and Its Application to Lake	merical Solutions and Experiments, W74-04662 5B	LEAF
Michigan,		Contribution to Knowledge about the Leaf
W74-04786 5C	LAND APPLICATION (WASTE WATER) Survey of Facilities Using Land Application of	Anatomy of Species of a 'Caatinga' of the Rio Negro (Amazon), (In Portuguese),
LAKE MONONA (WIS)	Wastewater,	W74-04682 21
Detailed Time Variations in Mean Temperature	W74-04677 5D	
and Heat Content of Some Madison Lakes,	LAND DEVELOPMENT	LEAKY AQUIFERS
W74-04659 2H	Multipurpose Reservoirs and Urban Develop-	The Response to Tidal Fluctuations of a Leaky Aquifer System,
LAKE MORPHOLOGY	ment,	W74-04308 2F
The Thermal Regime of Lake Lanao	W74-04319 6B	
(Philippines) and its Theoretical Implications for Tropical Lakes,	LAND MANAGEMENT	LEGAL ASPECTS
W74-04665 2H	Permafrost Considerations in Land Use	Southwestern Groundwater Law: A Textual and Bibliographic Interpretation,
	Planning Management, W74-04361 2C	W74-04460 4B
LAKE ONTARIO Aerial Radiological Measuring Survey of the		
Area Surrounding the Robert Emmett Ginna	Survey of Facilities Using Land Application of	What's Wrong with Government Water Control
Nuclear Power Plant, Ontario, New York,	Wastewater, W74-04677 SD	Programs and how They can be Improved, W74-04632 5D
Sept. 8, 1970.		W/4-04032
W74-04446 5A	LAND USE	LEGISLATION
Wave Action and Breakwater Design, Hamlin	Baseline Quality Data for Kalihi Stream, W74-04309 5B	Problem of Pure Water in the USA, (In Rus-
Beach Harbor, New York,	W/4-04309	sian), W74-04837 5G
W74-04588 8B	Sociocultural Impact of Reservoirs on Local	W 14-04831
LAKE SAMMAMISH (WASH)	Government Institutions, Anthropological Analysis of Social and Cultural Benefits and	LEGUMES
Nutrient Income Change Related to Plankton	Costs from Stream Control MeasuresPhase 4,	Effect of Long-Term Application of Variously
Algae,	W74-04311 6B	High Rates of Nutrients on Natural Grassland
W74-04318 5C	Permafrost Considerations in Land Use	Swards, W74-04693 4A
LAKE SEDIMENTS	Planning Management,	
Distribution and Uptake of Artificially In-	W74-04361 2C	Production Ability of Legumes, Grasses and
troduced Radium-226 in a Small Lake, W74-04785 5B	Institutional Framework Affecting the Use of	Their Mixtures in Hill-Land Regions, W74-04694 4A
	Inland Wetlands in Massachusetts,	W 74-04024 4A
LAKE WAUBESA (WIS)	W74-04462 4A	LEVEES
Detailed Time Variations in Mean Temperature and Heat Content of Some Madison Lakes,	The Rajasthan Canal Area: A Settlement Struc-	Suspended and Bedload Sediment Transport in
W74-04659 2H	ture,	the Snake and Clearwater Rivers in the Vicinity of Lewiston, Idaho,
LAVES	W74-04499 6D	W74-04846 2J
LAKES Recharge of a Central Alaska Lake by Subper-	LAND VALUES	
mafrost Groundwater,	Land Value Increments as a Measure of the	LIBYA (BENGHAZI HARBOUR)
W74-04394 2F	Net Benefits of Urban Water Supply Projects	Waves Off Benghazi Harbour - Libya, W74-04608 21
Relative Susceptibility of Lakes to Water-	in Developing Countries: Theory and Measure- ment,	W74-04608 2L
Quality Degradation in the Southern Hood	W74-04502 6B	LIGANDS
Canal Area, Washington,	I AND THE CO	Determination of the Complexing Capacity of
W74-04488 5B	LANDFILLS Hydrogeologic Considerations in Solid Waste	Natural Water, W74-04312 2K
Water Level Fluctuations of the Caspian Sea	Storage in Iowa: Part 1. Sanitary Landfill Site	W/4-04312
(K probleme urovennogo rezhima Kaspiyskogo	Selection: Part 2. A Method of Hazardous and	LIGHT
morya), W74-04575 2H	Toxic Waste Disposal,	Effect of Light on Vulnerability of Heat-
	W74-04592 5E	Stressed Sockeye Salmon to Predation by Coho Salmon.
Measurement of Adenosine Triphosphate	Hydrologic and Geologic Considerations for	W74-04671 5C
(ATP) in Two Precambrian Shield Lakes of Northwestern Ontario,	Solid-Waste Disposal in West-Central Florida, W74-04605 5E	
W74-04782 5B		A Numerical Model for Determining Integral Primary Production and Its Application to Lake
	LANDSLIDES	Michigan,
Movements of Phosphorus Between its Biologi- cally Important Forms in Lake Water,	A Numerical Classification of Selected Land- slides of the Debris Slide-Avalanche-Flow	W74-04786 5C
W74-04783 5B	Type,	
	W74-04591 2J	Effect of Light Intensity on the Quality and
LAKES INVENTORY (COLO) Lakes in the Boulder-Fort Collins-Greeley	Waves Generated by Horizontal Motion of a	Feeding Effectiveness of Green Fodder, (In
Area, Front Range Urban Corridor, Colorado,	Wall,	Russian),
W74-04496 2H	W74-04760 8B	W74-04821 3F

LIGNINS

LIGNINS	Rhomboid Ripple Mark, Indicator of Current	Littoral Drift as Function of Waves and Cur-
Color of Pulp Industry Waste Liquors. III. The	Direction and Environment,	rent,
Interaction of Chloro-Oxylignin with Metal	W74-04739 2J	W74-04623 2J
Salts (In Japanese), W74-04512 5D	LITTORAL DRIFT Littoral Transport in the Great Lakes,	Hydraulic Model Experiment on the Duffusion Due to the Coastal Current,
Aspects of Colour Removal from Pulp and	W74-04334 2J	W74-04628 5B
Paper Mill Effluents, W74-04514 5D	Mechanical Bypassing of Littoral Drift at In-	Longshore Currents in One and Multi-Bar
	lets,	Profiles Relation to Littoral Drift,
LIME	W74-04337 2L	W74-04749 2L
Extensive Effluent Treatment at Hodge Includes Color Removal.	Shores and Shore Processes,	LONGSHORE TRANSPORT
W74-04525 5D	W74-04339 2L	Quantitative Tracing of Littoral Drift, W74-04617 2J
Lime Disinfection of Sewage Bacteria at Low	Sediment Movement at Indian Ports,	LONGO NATIONAL MARKATANA
Temperature.	W74-04345 2L	LOPHOBTANCHIATE Syngnathus nigrolineatus nigrolineatus
W74-04548 5D	Morphology and Evolution of aLagoon Coast	(Eichwald) in the Frasinet River and Mostistea
LIMESTONES	on Sakhalin,	Lake, (In Rumanian),
Laboratory Study of Self-Sealing Limestone	W74-04433 2J	W74-04700 2I
Plugs for Mine Openings,	Submarine Sand Ridges as Indicators of	LOUISIANA
W74-04559 5G	Longshore Migration of Sediments,	Extensive Effluent Treatment at Hodge In-
LIMNETIC ALGAE	W74-04434 2J	cludes Color Removal.
The Analysis of Arsenic in the Lipid Phase		W74-04525 5D
from Marine and Limnetic Algae,	Application of Fluorescent Coated Sand in Lit-	at a notation and a second and a
W74-04557 5A	toral Drift and Inlet Studies, W74-04616 2L	Slope Development on a Mississippi River
LIMNOLOGY	W74-04616 2L	Bluff in Historic Time, W74-04585 2J
The Thermal Regime of Lake Lanao	Quantitative Tracing of Littoral Drift,	W 74-04365
(Philippines) and its Theoretical Implications	W74-04617 2J	Availability of Ground Water in the Winnsboro
for Tropical Lakes,	134 1 P 16 P 16 1 W 1 O	Area, Louisiana,
W74-04665 2H	Littoral Drift as Function of Waves and Cur-	W74-04596 4B
A Report on the Limnology of Monroe Reser-	rent, W74-04623 2J	Hypochlorination of Polluted Storm-Water Pumpage at New Orleans,
voir, Indiana, W74-04792 2H	The Atlantic Coast of Long Island,	W74-04676 5D
W/T-04/72	W74-04626 8A	
Wave Interaction and Langmuir Circulations,		LOUP RIVER (NEBR)
W74-04844 2H	Longshore Currents in One and Multi-Bar Profiles Relation to Littoral Drift,	Characteristics of Streamflow at Gaging Sta-
LINEAR PROGRAMMING	W74-04749 2L	tions in the Loup River Basin, Nebraska, W74-04794 2E
Cost-Benefit Analysis of Irrigation Projects in	11170117	W/4-04/94
Northeastern Brazil,	Rhythmic Pattern of Longshore Bars Related to	LOW FLOW
W74-04565 3F	Sediment Characteristics,	Quantity and Chemical Quality of Low Flow in
LINEAR SYSTEMS ANALYSIS	W74-04750 2J	the East Fork San Jacinto and West Fork San
Linear Systems Technique Applied to	Tracing Coastal Sediment Movement by Natu-	Jacinto Rivers near Houston, Texas, June 24, 26, 1969,
Hydrologic Data Analysis and Instrument	rally Radioactive Minerals,	W74-04481 5B
Evaluation: A Case Study on Data from the	W74-04753 2J	
Alice Springs Area,	Phenomena Affecting Improvement of the	LOW TEMPERATURE
W74-04470 2A	Lower Columbia Estuary and Entrance,	Lime Disinfection of Sewage Bacteria at Low
LIPIDS	W74-04763 2L	Temperature. W74-04548 5D
Analysis of Trace Elements, Phosphorus and		35
Sulphur, in the Lipid and the Non-Lipid Phase	LITTORAL TRANSPORT Shore Transport. Formation of Sand Spits and	LUMBER
of Halibut (Hippoglossus hippoglossus) and	Tombolos,	Water in Wood,
Tunny (Thunnus thynnus),	W74-04722 2J	W74-04545 2I
W74-04770 5A		MAGNETIC STUDIES
LIQUID	LOCAL GOVERNMENTS	Electromagnetic Probing of Permafrost,
Ecodistribution of Plutonium in Liquid Waste	Sociocultural Impact of Reservoirs on Local	W74-04400 2C
Disposal Areas at Los Alamos,	Government Institutions, Anthropological Analysis of Social and Cultural Benefits and	MAHANTANGO WATERSHED (PENN)
W74-04443 5B	Costs from Stream Control Measures-Phase 4,	Soluble Phosphate Output of an Agricultural
LIQUIDS	W74-04311 6B	Watershed in Pennsylvania.
A History and Preliminary Inventory Report on	A GOLDON DOWN OR A DEPOSIT	W74-04804 5B
the Kentucky Radioactive Waste Disposal Site,	Estimating the Benefits of Stream Valley and	BAANA CIVILATINI
W74-04442 5B	Open Space Preservation Projects.	MANAGEMENT Management of Stormwater Runoff in Subur-
LITTORAL	W74-04500 6B	ban Environments,
Theoretical Forms of Shorelines,		W74-04302 5D
W74-04336 2J	LONG WAVES	
Collective Mayamant of G. P	Transformation, Breaking and Run-Up of a	Optimal Operation of Multi-Reservoir Water
Collective Movement of Sediment in Littoral Environment.	Long Wave of Finite Height, W74-04741 2L	Resources Systems, W74-04314 4A
W74-04621 2J	11/4-04/41 2L	W74-04314 4A
	LONGSHORE CURRENTS	A Study of Water Institutions in Utah and
Littoral Vegetation Overgrowing in Some	The Possibility of Predicting Longshore Cur-	Their Influence on the Planning, Developing,
Lakes of Kalinin District, (In Russina),	rents in Tideless Seas,	and Managing of Water Resources,

A Simulation Model for Evaluating Irrigation	MASS TRANSPORT	Nucleonic Sediment Concentration Gauge -
Management Practices, W74-04564 3F	A Study on Mass Transport in Boundary	Comparison of Transmission and Scattering
W74-04564 3F	Layers in Standing Waves, W74-04615 2J	Modes, W74-04774 2J
Allocation of Scarce Resources to Agricultural	W/4-04613	W/4-04//4
Research: Review of Methodology,	MASS WASTING	MEASURING INSTRUMENTS
W74-04566 3F	Rates of Mass Wasting in the Ruby Range,	Waves Off Benghazi Harbour - Libya,
3.6.4 PROFILE	Yukon Territory,	W74-04608 2L
MAPPING Remote Sensing in Sampling Site Location in	W74-04371 2J	ACCORDING A MINA MINA MINA MINA
Lakes and Streams,	14 . 00 . 0111 oppos	MEDITERRANEAN CLIMATE
W74-04313 5A	MASSACHUSETTS Institutional Framework Affecting the Use of	Application of Dynamic Programming in Mar- kov Chains to the Evaluation of Water Quality
Indirect Mapping of the Snowcover for Per-	Inland Wetlands in Massachusetts,	in Irrigation, W74-04561 3C
mafrost Prediction at Schefferville, Quebec,	W74-04462 4A	W74-04561 3C
W74-04356 2C	Papermill Treatment Plant for Small Industry.	MEDUSA
Mapping and Predicting Permafrost in North	W74-04534 5D	Temperature Acclimation in the Medusa,
America: A Review, 1963-1973,		Chrysaora quinquecirrha,
W74-04398 2C	MASTIGOCLADUS-LAMINOSUS	W74-04660 5C
	Concerning Large-Scale Cultivation of Thermo-	MELT WATER
The Application of Shallow Seismic Methods to	philic Cosmopolitan Mastigocladus Laminousus Cohn (Cyanophyta) in Icelandic Hot Springs,	Effects of Stratigraphic Layers on Water Flow
Mapping of Frozen Surficial Materials, W74-04401 2C	W74-04486 21	Through Snow,
W74-04401 2C	11/1/01/00	W74-04572 2C
Reconnaissance of the Ground-Water	MATHEMATICAL MODELS	
Resources of Cimarron County, Oklahoma,	A Three-Dimensional Model for Estuaries and	Water Flow Through Snow Overlying an Im-
W74-04495 4B	Coastal Seas: Volume I, Principles of Compu-	permeable Boundary,
	tation,	W74-04803 2C
Lakes in the Boulder-Fort Collins-Greeley	W74-04301 2L	MELTING
Area, Front Range Urban Corridor, Colorado, W74-04496 2H	Mathematical Modeling of Stream Storage	Thermokarst Development, Banks Island,
W/+0430	Potential,	Western Canadian Arctic,
MAPS	W74-04305 2E	W74-04368 2C
Surface-Water Availability, Lauderdale Coun-		
ty, Alabama,	The Response to Tidal Fluctuations of a Leaky	MEMBRANES
W74-04494 2E	Aquifer System,	Water Cleaning Treatment,
MARINE ALGAE	W74-04308 2F	W74-04710 3A
The Analysis of Arsenic in the Lipid Phase	One-Dimensional Model of the Movement of	MERCURY
from Marine and Limnetic Algae,	Trace Radioactive Solute Through Soil	Characteristics of Pulp and Paper Mill Wastes
W74-04557 5A	Columns: The Percol Model,	and ISI Standards,
MADINE BACTERIA	W74-04444 5B	W74-04530 5B
MARINE BACTERIA A Bacteriological Pressure-Retaining Deep-Sea	THE RESERVE THE PROPERTY OF THE PARTY OF THE	
Sampler and Culture Vessel,	Effects of Urbanization on Floods in the Dal- las, Texas, Metropolitan Area,	Mercury Removal from Waste Water with
W74-04773 5A	W74-04483 4C	Starch Xanthate-Cationic Polymer Complex, W74-04541 5D
	W/4-04103	W/4-04541
MARKOV PROCESSES	Comments on Veronis' Paper, 'On Properties	Mercury Uptake and Ion Distribution in Gills
Application of Dynamic Programming in Mar-	of Seawater Defined by Temperature, Salinity,	of Rainbow Trout (Salmo gairdneri): Tissue
kov Chains to the Evaluation of Water Quality in Irrigation,	and Pressure',	Scans with an Electron Microprobe,
W74-04561 3C	W74-04658 2K	W74-04778 5A
W 14 04301	The Application of Numerical Simulation	MERISTIC STRUCTURES
MARSH SANDPIPER	Models in the Assessment of the Effect of	Effects of Temperature on Developing Meristic
A Find of Marsh Sandpiper Tringa stagnatilis in	Discharges into Coastal Waters,	Structures of Smallmouth Bass, Micropterus
the Netherlands,	W74-04674 5B	dolomieui Lacepede,
W74-04681 5C		W74-04663 5C
MARSHES	The Analysis of Harbor and Estuary Systems,	
Nutrients in Subsurface and Runoff Waters of	W74-04745 2L	MESOTROPHY
the Holland Marsh, Ontario,	A Numerical Model for Determining Integral	Nutrient Income Change Related to Planktor Algae,
W74-04478 5B	Primary Production and Its Application to Lake	W74-04318 50
Death of the Marshes in the Ardennes.	Michigan,	W/4-04510
W74-04686 4A	W74-04786 5C	METABOLISM
W/4-04000	ACCANDEDO	Changes in Enzymes in the Plant as Related to
MARYLAND	MEANDERS	Water Supply and Usage,
Response and Recovery of a Piedmont	The Fallacy of Baer's Law or Coriolis' Effect on the Meandering of Rivers.	W74-04306 2
Watershed from Tropical Storm Agnes, June	W74-04799 8B	Temperature Acclimation in the Medusa
1972, W74-04805 2J	W/4-04/22	Chrysaora quinquecirrha,
W74-04805 2J	MEASUREMENT	W74-04660 50
MASS SPECTROMETRY	Determination of Soil Moisture by Remote	
Mass Spectrometry and Inhomogeneous Ion	Sensing Techniques (Opredeleniye vlazhnosti	METAL IONS
Optics,	pochvy distantsionnymi aerokosmicheskimi	Determination of the Complexing Capacity of
W74-04475 5A	metodami),	Natural Water,
MASS TRANSFER	W74-04576 2G	W74-04312 2k
Application of the Finite Element Method to	Measurements of the Turbulent Fluxes of Mo-	METALLIC OXIDES
Convection Heat Transfer Between Parallel	mentum, Moisture and Sensible Heat Over the	Mass Spectrometry and Inhomogeneous Ion
Planes,	Ocean,	Optics,
W74-04765 8B	W74-04673 2E	W74-04475 5A

METALLOGENIUM

METALLOGENIUM Overgrowth of Ooze Iron-Manganese Microor-	MISSISSIPPIAN AQUIFER (IOWA) Mississippian Aquifer of Iowa,	Environmental Surveillance for Fuel Fabrica- tion Plants,
ganisms Studied by Electron Microscopy, (In Russian),	W74-04843 7C	W74-04451 5B
W74-04558 5A	MISSOURI Summary Report of Metromex Studies, 1971-	Environmental Radioactivity, W74-04456 5B
METEOROLOGY Trans-Pacific Fallout and Protective Counter-	1972. W74-04509 2B	MONROE RESERVOIR (IND) A Report on the Limnology of Monroe Reser-
measures, W74-04454 5B	MIXING	voir, Indiana, W74-04792 2H
METHOD VALIDATION	Mixing Processes, W74-04327 5B	
The Direct Enumeration of Escherichia coli in	W14-04321	MONSOONS Sediment Movement at Indian Ports,
Water Using Macconkey's Agar at 44 C in Plastic Pouches,	Estuarine Currents and Tidal Streams, W74-04344 2L	W74-04345 2L
W74-04768 5A	Zone of Flow Establishment for Round	MONTANA
METHODOLOGY Allocation of Scarce Resources to Agricultural	Buoyant Jets, W74-04657 5B	Evaluation of the Ground-Water Supply at Eight Sites in Glacier National Park,
Research: Review of Methodology,		Northwestern Montana, W74-04469 2F
W74-04566 3F	Reproduction of Estuarine Structure and Cur-	
METHOXYCHLOR	rent Observation Techniques in the Hecate Model.	Evaluation and Simulation of Chemical-Quality
The Effects of Methoxychlor on Aquatic Biota,	W74-04724 2L	Data for Five Montana Sampling Stations, W74-04484 2K
W74-04553 5C	Modeling of Turbulent Transport in the Surface	MORAN'S MODEL (DAMS)
METHYLMERCURY	Layer,	Mathematical Modeling of Stream Storage
Mercury Uptake and Ion Distribution in Gills of Rainbow Trout (Salmo gairdneri): Tissue	W74-04795 2D	Potential, W74-04305 2E
Scans with an Electron Microprobe,	MODEL STUDIES	W /4-04303
W74-04778 5A	Analytical Methods of Solution of Conjugated	MORTALITY
MICHIGAN	Problems in Convective Heat Transfer, W74-04667 8B	Thermal Responses in Cirrhina mrigala Fry, W74-04661 5C
Currents at Harbor Beach, Michigan,	W/4-0400/	W74-04661 5C
W74-04342 5B	Reproduction of Estuarine Structure and Cur- rent Observation Techniques in the Hecate	MOTHS Role of Soil Conditions in the Development of
Mill's Waste Water Used for Spray Irrigation.	Model,	Moths, (In Russian), W74-04640 3F
W74-04543 5D	W74-04724 2L	W74-04640 3F
MICROORGANISMS	MOISTURE	MUDFLOWS
Comparative Study, in 1966 and 1967, of Three Reservoirs in the Project of a Natural Park in	Measurements of the Turbulent Fluxes of Mo- mentum, Moisture and Sensible Heat Over the	Mudflows (Selevyye potoki), W74-04581 4D
the Morvan Region (In French), W74-04815 5C	Ocean, W74-04673 2E	MULTIPLE-PURPOSE RESERVOIRS Multipurpose Reservoirs and Urban Develop-
MINE SEALS	MOISTURE CONTENT	ment,
Laboratory Study of Self-Sealing Limestone	Settlement Associated with the Thawing of Per-	W74-04319 6B
Plugs for Mine Openings, W74-04559 5G	mafrost, W74-04408 2C	Reservoirs of Europe and Some Aspects of
MINE WATER	Water in Wood,	Their Construction and Multipurpose Use (Vodokhranilishcha zarubezhnoy Yevropy
Some Neglected Sources of Water Pollution	W74-04545 2I	nekotoryye voprosy ikh sozdaniya i komplek-
(Nedostatochno uchityvayemyye istochniki	MOIOTINE OTRECO	snogo ispol'zovaniya), W74-04582 8A
zagryazneniya prirodnykh vod), W74-04579 5B	MOISTURE STRESS Changes in Enzymes in the Plant as Related to	
W /4-043/9	Water Supply and Usage,	MUNICIPAL WATER
MINING	W74-04306 2I	Evaluation of the Use of Pricing as a Tool for Conserving Water,
Stability of an Underground Room in Frozen Gravel.	Plant Responses to Water Stress,	W74-04810 3D
W74-04418 2C	W74-04539 21	MUSSELS
		Ecological Investigations of Ponds with Special
MINNESOTA	MOISTURE UPTAKE Water in Wood,	Regard to the Consequences of Water Pollution
A Simulation Model for Evaluating Irrigation Management Practices,	W74-04545 2I	by Oil, (In German),
W74-04564 3F		W74-04635 5C
MATERIAL	MOLEHILLS	MUTANT VARIETIES
MISSISSIPPI Hydraulic Performance of BridgesExcava-	Water Denudation of Molehills in Mountainous Areas.	Drought Resistance of Radiation-Induced Mu-
tions at Bridges,	W74-04639 2J	tant Varieties and Parent Forms of Cotton, (Ir Russian),
W74-04482 8B	MONITORING	W74-04822 3F
MISSISSIPPI RIVER	Aerial Radiological Measuring Survey of the	MYXOVIRUSES
Slope Development on a Mississippi River	Area Surrounding the La Crosse Boiling Water	Relative Efficiency of Cell Cultures for Detec
Bluff in Historic Time,	Reactor, Genoa, Wisconsin, July 1968.	tion of Viruses,
W74-04585 2J	W74-04447 5A	W74-04767 5A
MISSISSIPPI RIVER BASIN	Aerial Radiological Measuring Survey of the	NATIONAL PARKS
Aerial Radiological Measuring Survey of the	Area Surrounding the Point Beach Nuclear	Evaluation of the Ground-Water Supply a
Area Surrounding the La Crosse Boiling Water	Plant, Two Creeks, Wisconsin, August 16 and	Eight Sites in Glacier National Park
Reactor, Genoa, Wisconsin, July 1968. W74-04447 5A	17, 1970. W74-04449 5A	Northwestern Montana, W74-04469 2F

2F

NATURAL RESOURCES Cento Seminar on the Application of Remote Sensors in the Determination of natural	Chemical Quality of Streams, Allegheny River Basin and Part of the Lake Erie Basin, New York.	Distribution of Permafrost in North America and Its Relationship to the Environment: A
Resources.	W74-04593 2K	Review, 1963-1973, W74-04353 2C
W74-04567 7B		
NEARSHORE	The Atlantic Coast of Long Island, W74-04626 8A	NORTH CARLOINA
Developmental History and Present-Day	W/4-04020	Determination of the Complexing Capacity of Natural Water,
Dynamics of the Chushka Spit,	A Field Study of Langmuir Circulations,	W74-04312 2K
W74-04428 2J	W74-04845 2H	
NEARSHORE PROCESSES	NEW YORK BAY	NORTH CAROLINA
Waves at Camp Pendleton, California,	Hurricane Tide Prediction for New York Bay,	Multipurpose Reservoirs and Urban Develop-
W74-04607 2E	W74-04343 2L	ment, W74-04319 6B
	AUTHOR OTHER AND OTHER DESIGNATION	W/4-04517
Laboratory Applications of Radioisotopic Tracers to Follow Beach Sediments,	NEW ZEALAND (HAWKE BAY) Sedimentation in Hawke Bay,	NORTHERN PIKE
W74-04751 2J	W74-04726 2L	Temperature Requirements for Embryos and
		Larvae of the Northern Pike, Esox lucius (Linnaeus).
NEBRASKA	NEW ZEALAND (MILFORD SOUND)	W74-04670 5C
Characteristics of Streamflow at Gaging Sta- tions in the Loup River Basin, Nebraska,	Studies of a Southern Fiord. W74-04727 2J	W/4-040/0
W74-04794 2E	W74-04727 2J	NORWAY
	NICARAGUA (MANAGUA)	Polluted Snow in Southern Norway During the
NEEDLE ICE	Prediction of the 1972 Managua, Nicaragua,	Winters 1968-1971,
A Simulation Sensitivity Analysis of the Needle Ice Growth Environment,	Earthquake from Groundwater Changes, In-	W74-04652 5B
W74-04370 2C	ferred Probability of Earthquakes in the City of	NOTOTHENIA-ROSSI-MARMORATA
	Managua, Nicaragua, during the Summer of 1973,	Daily Diet and Rate of Feeding of Notothenia
NETARTS BAY (OREG)	W74-04467 2F	rossi marmorata Fischer and Dissostichus elegi-
Pink and Chum Salmon Culture, W74-04797 8I		noides Smitt, Family Notothenidae, in the Area
W 14-04/9/	NILE DELTA	of Southern Georgia (USSR), (In Russian), W74-04679
NETHERLANDS	Fishery Survey Carried out at Lake Borullus, A. R. E., in the Spring of 1971, (In Czech),	W74-04679 2I
Water Pollution in the Netherlands,	W74-04643 2H	NUCLEAR EXPLOSIONS
W74-04536 5B		Strontium-90 and Cesium-137 Levels in Soils of
A Find of Marsh Sandpiper Tringa stagnatilis in	NITRATES	Various Types at Niigata Prefecture, Japan,
the Netherlands,	Radiological Status of the Groundwater	W74-04453 5B
W74-04681 5C	Beneath the Hanford Project, July-December 1972,	Trans-Pacific Fallout and Protective Counter-
Some Characteristics of the Dutch Coast,	W74-04452 5B	measures,
W74-04754 2J		W74-04454 5B
	Chemical Ecology: Evidence for Phosphate as	NUCLEAR POWERPLANT
NETHERLANDS (BIESBOSCH) Changes in the Avifauna of the Biesbosch in	the Only Factor Limiting Algal Growth in Lake Kinneret.	Aerial Radiological Measuring Survey of the
the 1st Yr After the Elimination of the Tide,	W74-04685 5C	Area Surrounding the Point Beach Nuclear
W74-04699 2I		Plant, Two Creeks, Wisconsin, August 16 and
	Eutrophication of Lake 227 by Addition of	17, 1970.
NEW JERSEY Numerical Computations of Storm Surges with	Phosphate and Nitrate: The Second, Third, and Fourth Years of Enrichment, 1970, 1971, and	W74-04449 5A
Bottom Stress,	1972,	NUCLEAR POWERPLANTS
W74-04759 2L	W74-04789 5C	Aerial Radiological Measuring Survey of the
	NUMBEROOFF	Area Surrounding the Robert Emmett Ginna
NEW MEXICO	NITROGEN Nutrients in Subsurface and Runoff Waters of	Nuclear Power Plant, Ontario, New York,
Ecodistribution of Plutonium in Liquid Waste Disposal Areas at Los Alamos,	the Holland Marsh, Ontario,	Sept. 8, 1970.
W74-04443 5B	W74-04478 5B	W74-04446 5A
	Production Abilian of S	Aerial Radiological Measuring Survey of the
NEW RIVER (VA) Hybridization Between the Darters Percina	Production Ability of Legumes, Grasses and Their Mixtures in Hill-Land Regions,	Area Surrounding the La Crosse Boiling Water
crassa roanoka and Percina oxyrhyncha	W74-04694 4A	Reactor, Genoa, Wisconsin, July 1968.
(Percidae, Etheostomatini), with Comments on		W74-04447 5A
the Distribution of Percina crassa roanoka in	Horizontal Distribution of Some Chemical and	Aerial Radiological Measuring Survey of the
New River,	Physical Characteristics in Lipno Reservoir, W74-04814 5C	Area Surrounding the Vermont Yankee
W74-04472 2E	W/4-04614	Generating Station and the Yankee Nuclear
NEW YORK	NITROGEN COMPOUNDS	Power Station, September 18, 1970.
Aerial Radiological Measuring Survey of the	Paper Mill Sludge Disposal on Soils: Effects on	W74-04448 5A
Area Surrounding the Robert Emmett Ginna Nuclear Power Plant, Ontario, New York,	the Yield and Mineral Nutrition of Oats (Avena satival.).	Environmental Surveillance for Fuel Fabrica-
Sept. 8, 1970.	W74-04519 5E	tion Plants,
W74-04446 5A	NON CERTICIPAL AL PERMANEURO	W74-04451 5B
	NON-STRUCTURAL ALTERNATIVES Flood Proofing Decisions Under Uncertainty:	Industry Awaits Solutions to Problems of High-
Syracuse Metropolitan Area Comprehensive Plan-Water and Sewer Plan and Services Allo-	An Application to the Connecticut River Basin,	Level Radioactive-Waste Management,
cation Plan,	W74-04463 6A	W74-04457 5D
W74-04507 5D		Budada Padasa 11
Wave Action and Preshuster Design II	NORTH AMERICA Permafrost: North American Contribution to	Reviewing Environmental Impact Statements- Power Plant Cooling Systems, Engineering
Wave Action and Breakwater Design, Hamlin Beach Harbor, New York,	Second International Conference.	Aspects,
W74-04588 8B	W74-04346 2C	W74-04555 5G

NUCLEAR REACTORS

NUCLEAR REACTORS	Waves at Camp Pendleton, California,	OKLAHOMA
Environmental Monitoring and Disposal of	W74-04607 2E	Reconnaissance of the Ground-Water
Radioactive Wastes from U.S. Naval Nuclear-	OCEANOGRAPHY	Resources of Cimarron County, Oklahoma,
Powered Ships and Their Support Facilities,	International Decade of Ocean Exploration.	W74-04495 4B
1972,	W74-04473 6E	OLIVE-GREEN CELLS
W74-04441 5B	W/4-04/3	The Transport of Organic Carbon to Organisms
Breeder Reactors: Power for the Future,	OCEANS	Living in the Deep Oceans,
W74-04656 8C	Measurements of the Turbulent Fluxes of Mo-	W74-04790 5C
1177 07030	mentum, Moisture and Sensible Heat Over the	
NUCLEONIC GAUGE	Ocean,	ON-SITE DATA COLLECTIONS
Nucleonic Sediment Concentration Gauge -	W74-04673 2E	A Radiological Environmental Survey at EBR-
Comparison of Transmission and Scattering	OFFICIORE MI ATROPIAGE	II,
Modes,	OFFSHORE PLATFORMS	W74-04455 5B
W74-04774 2J	Laboratory Experiments to Determine the	OPERATING COSTS
ANIMATING AT ANIAT MOTO	Structural Response of a Vertical Pile Sub- jected to Wind-Generated Water Waves,	Low Cost Methods for Treating Pulp and Paper
NUMERICAL ANALYSIS	W74-04424 8B	Mill Effluents.
A Three-Dimensional Model for Estuaries and	W/4-04424 6B	W74-04531 5D
Coastal Seas: Volume I, Principles of Computation,	OIL FIELDS	W 74 04331
W74-04301 2L	Permafrost Protection for Pipelines,	OPERATION AND MAINTENANCE
W/4-04301 ZL	W74-04415 2C	Water Reuse and Deposits Control,
Application of the Concept of Rectilinear Vor-		W74-04520 5D
tices to the Movement of Oil Slicks,	Permafrost-Related Engineering Geology	
W74-04490 5B	Problems Posed by the Trans-Alaska Pipeline,	OPTIMIZATION
	W74-04416 8D	Optimal Operation of Multi-Reservoir Water
NUMERICAL WAVE THEORY	Effects of County Inc Variability and Desulting	Resources Systems,
Breaking Wave Criteria; A Study Employing a	Effects of Ground-Ice Variability and Resulting Thaw Settlements on Buried Warm-Oil	W74-04314 4A
Numerical Wave Theory,	Pipelines,	OPTIMUM DEVELOPMENT PLANS
W74-04610 2E	W74-04422 4C	A Design Procedure for the Conjunctive Use of
	W/4-04422 4C	Surface and Groundwater Storages,
NUTRIENTS	Performance of a Warm-Oil Pipeline Buried in	W74-04598 4B
Nutrients in Subsurface and Runoff Waters of	Permafrost,	W 74-04376 4B
the colland Marsh, Ontario,	W74-04423 8D	OREGON
W74-04478 5B		Willamette Cleanup,
Effect of Long-Term Application of Variously	OIL INDUSTRY	W74-04522 5D
High Rates of Nutrients on Natural Grassland	Laboratory Experiments to Determine the	
Swards.	Structural Response of a Vertical Pile Sub-	Boise Cascade Paper Mill and St. Helens Share
W74-04693 4A	jected to Wind-Generated Water Waves,	Treatment Lagoon.
W14-04075	W74-04424 8B	W74-04535 5D
Production Ability of Legumes, Grasses and	OH BOLLETTON	Vanhama San Sunface Tamanatum and Salinitu
Their Mixtures in Hill-Land Regions,	OIL POLLUTION	Inshore Sea Surface Temperature and Salinity Conditions at Agate Beach, Yaquina Bay and
W74-04694 4A	Ecological Investigations of Ponds with Special	
	Regard to the Consequences of Water Pollution by Oil, (In German),	Whale Cove, Oregon, in 1970, W74-04730 2L.
The Transport of Organic Carbon to Organisms	W74-04635 5C	W 74-04730 2L
Living in the Deep Oceans,	W74-04033	Pink and Chum Salmon Culture,
W74-04790 5C	Anti-Pollution Barrier,	W74-04797 8I
	W74-04705 5G	
Utilization of Nutrients from Soil and Fertil-		ORGANIC CARBON
izers by Pasture Grass as Dependent on Soil	Anti-Pollution Barge and Conveyer Assembly,	Heterotrophic Utilization of Sucrose in an Ar-
Moisture (In Russian),	W74-04718 5G	tificially Enriched Lake,
W74-04820 4A		W74-04781 5C
Nutrient Uptake by Winter Wheat in a Zone of	Laboratory Studies of the Accommodation of	m - m
Unstable Moisture, (In Russian),	Some Crude and Residual Fuel Oils in Sea	The Transport of Organic Carbon to Organisms
W74-04827 3F	Water,	Living in the Deep Oceans,
31	W74-04775 5B	W74-04790 5C
OATS	Problem of Pure Water in the USA, (In Rus-	Ratio of Organic Carbon with Different Types
Paper Mill Sludge Disposal on Soils: Effects on	sian),	of Oxidizability in the Open Water of Baikal (In
the Yield and Mineral Nutrition of Oats (Avena	W74-04837 5G	Russian).
satival.),		W74-04819 5C
W74-04519 5E	OIL SPILLS	
	Application of the Concept of Rectilinear Vor-	ORGANIC COMPOUNDS
OCEAN CIRCULATION	tices to the Movement of Oil Slicks,	Analysis of Organic Pollutants in Water and
Comments on Johnson's Paper, 'On the Wind-	W74-04490 5B	Waste Water,
Driven Circulation of a Stratified Ocean',		W74-04633 5A
W74-04675 2E	Anti-Pollution Barrier,	December for Beducine the Occasio Codes
OCEAN WAVES	W74-04705 5G	Processes for Reducing the Organic-Carbon
Physical and Dynamical Scales for Generation	Anti-Pollution Barge and Conveyer Assembly,	Content of Water Contaminated with Organic Compounds by Continuous Countercurrent
of Wind Waves,	W74-04718 5G	Multistage Treatment with Activated Carbon,
W74-04330 2E	11.1-01/10	W74-04704 SD
34330 ZE	OIL WASTES	11 14 10 10 1 3D
Laboratory Experiments to Determine the	Waste Automotive Lubricating Oil as a Mu-	Hydrocarbon and Chlorophyll: A Correlation in
Structural Response of a Vertical Pile Sub-	nicipal Incinerator Fuel,	the Upwelling Region off West Africa,
jected to Wind-Generated Water Waves,	W74-04549 5D	W74-04771 5B
W74-04424 8B		
	Laboratory Studies of the Accommodation of	The Effect of Water Spraying on the Rein-
The Elevation, Slope, and Curvature Spectra of	Some Crude and Residual Fuel Oils in Sea	Forcement of Physiological Process in Cotton
a Wind Roughened Sea Surface,	Water,	Plants,
W74-04476 2E	W74-04775 5B	W74-04823 3F

3F

ORGANIC MATTER	OXIDES	Apparatus for Treating Industrial and Domestic
Process for Purifying Water that Contains Or-	Hydrogen Peroxide for Industrial Pollution	Waste Waters,
ganic Matter,	Control,	W74-04707 5D
W74-04716 5D	W74-04532 5D	
		Sedimentation Tanks,
Micro- and Mesobenthos Development as a	OXYGEN	W74-04708 5D
Factor of Soil Composition (In Russian),	The Use of Computer Simulations for Systems	Mathed and Amentus for the Dislocical Treat
W74-04816 2H	Ecological Studies in the Baltic,	Method and Apparatus for the Biological Treat-
	W74-04634 5B	ment of Waste Water,
Distribution of Organic Matter and Bacteria in		W74-04709 5D
the Upper Layer of Bottom Deposit of Lake	OXYGENATION	Water Cleaning Treatment,
Balaton.	Apparatus for Treating Industrial and Domestic	W74-04710 3A
W74-04839 5B	Waste Waters,	W/4-04/10
75 SB	W74-04707 5D	Floating Breakwater Pontoon,
ORGANIZATIONS		W74-04711 8B
What Do We Mean by Metropolitan Water	OZONIZATION	
Management Institutions	Ozonization as a Method of Purifying Water	Screening Aerator Concentrator,
	Polluted with Chemical Composition, (In Rus-	W74-04712 5D
W74-04498 6E	sian),	
ORGANOPHOSPHORUS COMPOUNDS	W74-04836 5D	Skimmer Trap,
Movements of Phosphorus Between its Biologi-		W74-04713 5G
	PADDY FIELD	24 4 1 1 4 4 4 4 7 TO 1 TO
cally Important Forms in Lake Water,	A Study on the Accuracy of Runoff Analysis	Method and Apparatus for Treating Effluent,
W74-04783 5B	for Pumping Drainage in Paddy Field Area (In	W74-04714 5D
000000	Japanese),	C tols Commenter Con Minutine Fish
OSCILLATORY WAVES	W74-04811 4A	Conduit Structure for Migrating Fish,
Effect of Beach Slope and Shoaling on Wave		W74-04715 8I
Asymmetry,	PALEOCLIMATOLOGY	Process for Purifying Water that Contains Or-
W74-04612 2E	Postglacial Permafrost Features in Eastern	ganic Matter,
	Canada,	W74-04716 5D
OUTFALL SEWERS	W74-04358 2C	W/4-04/16 3D
Mixing Processes,		Method of Treating Sewage Using High
W74-04327 5B	PALEOHYDROLOGY	Polymer Ratio Flocculation Agent Biologically
	Paleohydrology and Sedimentology of Lake	Produced in Situ.
Buoyancy Spread of Waste Water in Coastal	Missoula Flooding in Eastern Washington,	W74-04717 5D
Regions,	W74-04599 2E	W/4-04/1/
W74-04630 5B		Anti-Pollution Barge and Conveyer Assembly,
W/4-04030	PARASITE	W74-04718 5G
OVERLAND FLOW	Parasite Fauna of Ctenopharyngodon idella	11/1-0//10
Effects of Permafrost on Stream Flow Charac-	from Pond- and Spawning-Nursery Fisheries in	Apparatus for Treating Waste Fluids by Means
	the Volga Delta, (In Russian),	of Dissolved Gases,
teristics in the Discontinuous Permafrost Zone	W74-04702 8I	W74-04719 5D
of Central Alaska,		***************************************
W74-04392 2C	PARKS	Solar Distillation Apparatus,
S-i P F Will-I S	Estimating the Benefits of Stream Valley and	W74-04720 3A
Spring Runoff From Hillslopes, Small	Open Space Preservation Projects,	
Watersheds, and River Basins (Vesenniy stok	W74-04500 6B	PATH OF POLLUTANTS
so sklonov, malykh vodosborov, rechnykh bas-		Baseline Quality Data for Kalihi Stream,
seynov),	PARLANGE'S METHOD	W74-04309 5B
W74-04577 2E	On Solving the Unsaturated Flow Equation: 2.	
	Critique of Parlange's Method.	One-Dimensional Model of the Movement of
OWNERSHIP COSTS	W74-04492 2G	Trace Radioactive Solute Through Soil
Institutional Framework Affecting the Use of		Columns: The Percol Model,
Inland Wetlands in Massachusetts,	PARTICLE SIZE	W74-04444 5B
W74-04462 4A	The Effect of Collecting Time and Grain Size	N
	on the Sampling of Stream Sediments for	Nutrients in Subsurface and Runoff Waters of
OXIDATION	Geochemical Mapping in the St. Catharines	the Holland Marsh, Ontario,
Hydrogen Peroxide for Industrial Pollution	Area, Ontario,	W74-04478 5B
Control,	W74-04587 2J	Application of the Concept of Rectilinear Vor-
W74-04532 5D		tices to the Movement of Oil Slicks.
30	Laboratory Study of Scale Effects in Two-	
Catalytic Oxidation and Thermal Treatment of	Dimensional Beach Processes,	W74-04490 5B
Waste Waters (Kataliticheskoe okislenie i ter-	W74-04748 2L	A Proposal for the Investigation of Possible
micheskoe obezvrezhivanie stochnykh vod),		Ground-Water Contamination in the Bangor
W74-04537 5D	PASTURE GRASS	Area, Kitsap County, Washington,
30	Utilization of Nutrients from Soil and Fertil-	W74-04491 5B
Effects of Cadmium and Copper on the Oxida-	izers by Pasture Grass as Dependent on Soil	11 / VIII)
tion of Lactate by Rainbow Trout (Salmo gaird-	Moisture (In Russian),	Hydrologic and Geologic Considerations for
nert) Gills,	W74-04820 4A	Solid-Waste Disposal in West-Central Florida,
W74-04780 5C		W74-04605 5E
30	PATENTS	
Ratio of Organic Carbon with Different Types	Processes for Reducing the Organic-Carbon	Hydraulic Model Experiment on the Duffusion
of Oxidizability in the Open Water of Baikal (In	Content of Water Contaminated with Organic	Due to the Coastal Current,
Russian).	Compounds by Continuous Countercurrent	W74-04628 5B
	Multistage Treatment with Activated Carbon,	
W74-04819 5C	W74-04704 5D	Buoyancy Spread of Waste Water in Coastal
OXIDATION PONDS		Regions,
	Anti-Pollution Barrier,	W74-04630 5B
Role of Phyto- and Zooplankton in Self-Purifi-	W74-04705 5G	
cation Processes (Exemplified by Oxidation		Heterotrophic Utilization of Sucrose in an Ar-
Ponds), (In Russian),	Water Purification,	tificially Enriched Lake,
W74-04692 5G	W74-04706 5F	W74-04781 5C

PATH OF POLLUTANTS

Movements of Phosphorus Between its Biologi- cally Important Forms in Lake Water,	Thermal Disturbance Due to Channel Shifting, Mackenzie Delta, N.W.T., Canada,	Soil Development and Patterned Ground Evolution in Beacon Valley Antarctica,
W74-04783 5B	W74-04351 2C	W74-04372 2G
Distribution and Uptake of Artificially Introduced Radium-226 in a Small Lake, W74-04785 5B	Ecological Effects of River Flooding and Forest Fires on Permafrost in the Taiga of Alaska,	Physics, Chemistry, and Mechanics of Frozen Ground: A Review, W74-04373 2C
	W74-04352 2C	
PATTERNED GROUND Growth of Patterned Ground in Victoria Land,	Distribution of Permafrost in North America	Mechanical Properties of Frozen Ground Under High Pressure, W74-04375 2C
Antarctica, W74-04367 2C	and Its Relationship to the Environment: A Review, 1963-1973,	
Striated Ground, A Type of Patterned Ground	W74-04353 2C	Evaluation of in Situ Creep Properties of Frozen Soils with the Pressuremeter,
in the Periglacial Area of the Venezuelan	A Geoecological Terrain Analysis of Discon-	W74-04377 2C
Andes, (In Spanish), W74-04651 2G	tinuously Frozen Ground in the Upper Macken- zie River Valley, Canada,	Thaw Consolidation of Alaskan Silts and Granular Soils,
PEAS	W74-04354 2C	W74-04379 2C
Effect of Light Intensity on the Quality and Feeding Effectiveness of Green Fodder, (In	A Spatial Correlation Between Plant Distribu-	Soil Freezing in Relation to Pore Water Pres-
Russian),	tion and Unfrozen Ground Within a Region of Discontinuous Permafrost,	sure and Temperature, W74-04381 2C
W74-04821 3F	W74-04355 2C	
PELECUS-CULTRATUS The Feeding of Pelecus Cultratus L. in Kairak-	Indirect Mapping of the Snowcover for Per- mafrost Prediction at Schefferville, Quebec,	Ionic Mobility in Permafrost, W74-04382 2C
kum Reservoir, (In Russian), W74-04695 2H	W74-04356 2C	Practical Extensions to a Theory of Consolida- tion for Thawing Soils.
PENNSYLVANIA	Permafrost and Its Relationship to Other En- vironmental Parameters in a Midlatitude, High-	W74-04384 2C
Mathematical Modeling for Status Prediction	Altitude Setting, Front Range, Colorado Rocky	Experimental Pressure Studies on Frost Heave
and Control of Water Distribution Systems, W74-04320 4A	Mountains, W74-04357 2C	Mechanisms and the Growth-Fusion Behavior of Ice.
Estimating the Benefits of Stream Valley and		W74-04385 2C
Open Space Preservation Projects,	Postglacial Permafrost Features in Eastern Canada.	Triaxial and Creep Tests on Frozen Ottawa
W74-04500 6B	W74-04358 2C	Sand, W74-04386 2C
Soluble Phosphate Output of an Agricultural	The Occurrence and Characteristics of	
Watershed in Pennsylvania, W74-04804 5B	Nearshore Permafrost, Northern Alaska, W74-04359 2C	Sample Disturbance and Thaw Consolidation of a Deep Sand Permafrost,
PERCOLATION	Geophysical Identification of Frozen and Un-	W74-04387 2C
Sea Waves and Beach Cusps, W74-04734 2J	frozen Ground, Antarctica, W74-04360 2C	Viscoelastic Properties of Frozen Soil Under Vibratory Loads,
Modification of Wave Spectra on the Continen-	Permafrost Considerations in Land Use	W74-04388 8D
tal Shelf and in the Surf Zone, W74-04762 2L	Planning Management, W74-04361 2C	Pore Water and Heaving Pressures Developed in Partially Frozen Soils,
Water Flow Through Snow Overlying an Im-		W74-04389 2C
permeable Boundary, W74-04803 2C	Permafrost and Snowcover Relationships Near Schefferville,	Shear Strength at a Thaw Interface,
	W74-04362 2C	W74-04390 2C
PERIGLACIAL AREAS Striated Ground, A Type of Patterned Ground	Studies at the Timmins 4 Permafrost Experi-	Groundwater Investigations in Permafrost Re- gions of North America: A Review,
in the Periglacial Area of the Venezuelan	mental Site, W74-04363 2C	W74-04391 2F
Andes, (In Spanish), W74-04651 2G	Geochemistry of Permafrost and Quaternary	Effects of Permafrost on Stream Flow Charac-
PERMAFROST	Stratigraphy,	teristics in the Discontinuous Permafrost Zone of Central Alaska,
Permafrost: North American Contribution to	W74-04364 2C	W74-04392 2C
Second International Conference. W74-04346 2C	Stratigraphy and Diagenesis of Perennially Frozen Sediments in the Barrow, Alaska, Re-	Groundwater Pore Pressures Adjacent to Sub- arctic Streams.
Thermal Conditions in PermafrostA Review	gion,	W74-04393 2C
of North American Literature, W74-04347 2C	W74-04365 2C	Recharge of a Central Alaska Lake by Subper-
Influence of Climatic and Terrain Factors on	Origin, Composition, and Structure of Perenni- ally Frozen Ground and Ground Ice: A Review,	mafrost Groundwater,
Ground Temperatures at Three Locations in	W74-04366 2C	W74-04394 2F
the Permafrost Region of Canada, W74-04348 2C	Growth of Patterned Ground in Victoria Land,	Risk of Uncontrolled Flow from Wells Through Permafrost.
Deep Temperature Observations in the Canadi-	Antarctica, W74-04367 2C	W74-04395 2F
an North,		A Groundwater Supply for an Oil Camp Near
W74-04349 2C	Thermokarst Development, Banks Island, Western Canadian Arctic,	Prudhoe Bay, Arctic Alaska, W74-04396 2F
A General Solution for the Two-Dimensional, Transient Heat Conduction Problem in Per-	W74-04368 2C	The Nature of the Seawater-Freshwater Inter-
mafrost, Using Implicit, Finite Difference	Problems in the Origin of Massive Icy Beds,	face During Breakup in the Colville River
Methods, W74-04350 2C	Western Arctic, Canada, W74-04369 2C	Delta, Alaska, W74-04397 2C
		20

Mapping and Predicting Permafrost in North America: A Review, 1963-1973,	Encountering Massive Ground Ice During Road Construction in Central Alaska,	Eutrophication of Lake 227 by Addition of Phosphate and Nitrate: The Second, Third, and
W74-04398 2C	W74-04420 4C	Fourth Years of Enrichment, 1970, 1971, and 1972,
In Situ Physicomechanical Properties of Permafrost Using Geophysical Techniques,	The Use of Polyurethane Foam Plastics in the Construction of Expedient Roads on Per-	W74-04789 5C
W74-04399 2C	mafrost in Central Alaska, W74-04421 8G	Soluble Phosphate Output of an Agricultural Watershed in Pennsylvania.
Electromagnetic Probing of Permafrost, W74-04400 2C	Effects of Ground-Ice Variability and Resulting Thaw Settlements on Buried Warm-Oil	W74-04804 5B
The Application of Shallow Seismic Methods to Mapping of Frozen Surficial Materials,	Pipelines, W74-04422 4C	PHOSPHORUS Nutrient Income Change Related to Plankton Algae.
W74-04401 2C	Performance of a Warm-Oil Pipeline Buried in	W74-04318 5C
Investigation of Sampling Perennially Frozen Alluvial Gravel by Core Drilling,	Permafrost, W74-04423 8D	Phosphorus Relationships in Runoff from Fer- tilized Soils,
W74-04402 2C	PERMEABILITY	W74-04471 5B
Potential Use of Airborne Dual-Channel In-	Studies on the Validity of Darcy's Law for Flow in Natural Sands.	Nutrients in Subsurface and Runoff Waters of
frared Scanning to Detect Massive Ice in Per- mafrost,	W74-04307 2F	the Holland Marsh, Ontario, W74-04478 5B
W74-04403 7B	PESTICIDE RESIDUES	The Use of Computer Simulations for Systems
Engineering Design and Construction in Permafrost Regions: A Review,	Some Neglected Sources of Water Pollution (Nedostatochno uchityvayemyye istochniki zagryazneniya prirodnykh vod),	Ecological Studies in the Baltic, W74-04634 5B
W74-04404 8D	W74-04579 5B	
Some Passive Methods of Controlling Geocryological Conditions in Roadway Con-	PESTICIDE TOXICITY The Effects of Methoxychlor on Aquatic Biota,	The Relation Between Phytoplankton and Phosphate in the Lake of Constance, (In Ger-
struction,	W74-04553 5C	man), W74-04637 5C
W74-04406 2C	PHENOL COMPOUND	Analysis of Trace Elements, Phosphorus and
Environmental Considerations for the Utiliza- tion of Permafrost Terrain,	Influence of Environmental Moisture Condi- tions on the Phenol Compound Amount in Cal-	Sulphur, in the Lipid and the Non-Lipid Phase of Halibut (Hippoglossus hippoglossus) and
W74-04407 2C	luna Vulgaris L., W74-04487 2I	Tunny (Thunnus thynnus),
Settlement Associated with the Thawing of Per-		W74-04770 5A
mafrost, W74-04408 2C	PHENOLS Hydrogen Peroxide for Industrial Pollution	Movements of Phosphorus Between its Biologi- cally Important Forms in Lake Water,
Control of Permafrost Degradation Beneath a	Control, W74-04532 5D	W74-04783 5B
Roadway by Subgrade Insulation, W74-04409 4C	Effects of Toxicants on Brackish-Water Phytoplankton Assimilation,	Horizontal Distribution of Some Chemical and Physical Characteristics in Lipno Reservoir,
Thermal Regime in an Arctic Earthfill Dam, W74-04410 8D	W74-04644 5C	W74-04814 5C
Analysis of the Proposed Little Chena River,	Thin-Layer and Gas-Chromatographic Deter- mination of Phenols Present in Water, (In Ger-	PHOSPHORUS REMOVAL Effect of Phosphorus Removal Processes on
Earthfilled Nonretention Dam, Fairbanks,	man), W74-04684 5A	Algal Growth, W74-04552 50
Alaska, W74-04412 8D	PHILADELPHIA (PA	200 MGD Activated Sludge Plant Removes
Some Effects of Surface Disturbance on the	Mathematical Modeling for Status Prediction and Control of Water Distribution Systems,	Phosphorus by Pickle Liquor, W74-04554 5D
Permafrost Active Layer at Inuvik, N.W.T., Canada,	W74-04320 4A	
W74-04413 4C	PHILADELPHIA (PENN)	PHOTOSYNTHESIS Potential Intensity of Photosynthesis in Some
Corps of Engineers Technology Related to Design of Pavements in Areas of Permafrost.	Estimating the Benefits of Stream Valley and Open Space Preservation Projects,	Tomato and Beet Species Under Different Soil Moisture, (In Russian),
W74-04414 4C	W74-04500 6B	W74-04691 3F
Permafrost Protection for Pipelines, W74-04415 2C	PHILIPPINES (LAKE LANAO) The Thermal Regime of Lake Lanao	Diurnal Variation of Dissolved Inorganic Car- bon and its Use in Estimating Primary Produc-
	(Philippines) and its Theoretical Implications for Tropical Lakes,	tion and CO2 Invasion in Lake 227,
Problems Posed by the Trans-Alaska Pipeline,	W74-04665 2H	W74-04784 5A Production of Epilithiphyton in Two Lakes of
W74-04416 8D	PHOSPHATES Phosphorus Relationships in Runoff from Fer-	the Experimental Lakes Area, Northwestern
Long-Term Effects of Vegetative Cover on Permafrost Stability in an Area of Discontinu-	tilized Soils, W74-04471 5B	Ontario, W74-04787 50
ous Permafrost, W74-04417 4C	The Relation Between Phytoplankton and	The Effect of Water Spraying on the Rein- Forcement of Physiological Process in Cotton
Stability of an Underground Room in Frozen	Phosphate in the Lake of Constance, (In German),	Plants,
Gravel, W74-04418 2C	W74-04637 5C	W74-04823
	Chemical Ecology: Evidence for Phosphate as	PHYTOCOENOSES
A Sewage-Treatment Concept for Permafrost Areas,	the Only Factor Limiting Algal Growth in Lake Kinneret,	Ridge-Pool Complex Formation of Khotkhur- sky Bog Mass (In Russian),
W74-04419 5D	W74-04685 5C	W74-04812 3F

PHYTOPLANKTON

PHYTOPLANKTON Nutrient Income Change Related to Plankton	Effects of Ground-Ice Variability and Resulting Thaw Settlements on Buried Warm-Oil Pipelines,	The Analysis of Arsenic in the Lipid Phase from Marine and Limnetic Algae, W74-04557 5A
Algae, W74-04318 5C	W74-04422 4C	Analytical Techniques for the Determination of
The Relation Between Phytoplankton and Phosphate in the Lake of Constance, (In Ger-	Performance of a Warm-Oil Pipeline Buried in Permafrost,	Petroleum Contamination in Marine Organisms, W74-04594 5A
man), W74-04637 5C	W74-04423 8D	Analysis of Organic Pollutants in Water and
Effects of Toxicants on Brackish-Water	PLANNING What Do We Mean by Metropolitan Water	Waste Water, W74-04633 5A
Phytoplankton Assimilation, W74-04644 5C	Management Institutions., W74-04498 6E	Determination of Microgram Quantities of Polyethylene Polyamines in Water, (In Rus-
Phytoplankton Dynamics in the Severskiy Donets River for the First Years After its	State Environmental Management, Case Stu- dies of Nine States,	sian), W74-04701 5A
Regulation, (In Russina), W74-04648 5C	W74-04503 5G	Relative Efficiency of Cell Cultures for Detec- tion of Viruses,
Relation Between the Amount of Net	Managing Growth in a Fragile Environment: Problems of the Rocky Mountain States,	W74-04767 5A
Zooplankton and the Depth of Station in Shal- low Lipno Reservoir,	W74-04505 6D	Use of a Silver-Sulfide Electrode for Stan- dardizing Aqueous Sulfide Solution in Deter-
W74-04680 5C	Prattville, Alabama Community Development Plan, Vol. II: Summary and Illustrations.	mining Sulfide in Water, W74-04777 5A
Role of Phyto- and Zooplankton in Self-Purifi- cation Processes (Exemplified by Oxidation	W74-04508 5D	Identification of Bacteria by Computer: Theory
Ponds), (In Russian),	Housing and Planning References. W74-04511 3D	and Programming,
	PLANT PHYSIOLOGY	W74-04791 5A
The Phytoplankton Productivity in the Pyasina River Near Tareya Village (Western Taimyr),	Plant Responses to Water Stress,	POLLUTANTS A Study of Diffusion in an Estuary,
(In Russian), W74-04698 2I	W74-04539 2I	W74-04333 5B
Hydrocarbon and Chlorophyll: A Correlation in	PLASTICS The Use of Polyurethane Foam Plastics in the	Biochemical Ecology of Water Pollution, W74-04523 5C
the Upwelling Region off West Africa, W74-04771 5B	Construction of Expedient Roads on Per- mafrost in Central Alaska,	POLLUTION
	W74-04421 8G	State Environmental Management, Case Stu- dies of Nine States.
A Numerical Model for Determining Integral Primary Production and Its Application to Lake	PLEISTOCENE EPOCH	W74-04503 5G
Michigan, W74-04786 5C	Paleohydrology and Sedimentology of Lake Missoula Flooding in Eastern Washington, W74-04599 2E	POLLUTION ABATEMENT State-of-Art Review: Water Pollution Control Benefits and Costs, Vol I,
Eutrophication of Lake 227 by Addition of Phosphate and Nitrate: The Second, Third, and	PLUTONIUM	W74-04464 5G
Fourth Years of Enrichment, 1970, 1971, and 1972, W74-04789 5C	Ecodistribution of Plutonium in Liquid Waste Disposal Areas at Los Alamos, W74-04443 5B	Research Needs and Priorities: Water Pollution Control Benefits and Costs, Vol. II,
PICKLE LIQUOR	POLAND (KARKONOSZE MOUNTAINS)	W74-04465 5G
200 MGD Activated Sludge Plant Removes Phosphorus by Pickle Liquor,	Water Denudation of Molehills in Mountainous Areas,	Environmental Quality, The Fourth Annual Report of the Council on Environmental Quality. W74-04504
W74-04554 5D	W74-04639 2J	Pollutant Removal Handbook,
PIKES Temperature Requirements for Embryos and	POLAND (KORONOWO RESERVOIR) Observations on the Vegetation of the	W74-04527 5D
Larvae of the Northern Pike, Esox lucius	Koronowo Reservoir,	Low Cost Methods for Treating Pulp and Paper
(Linnaeus), W74-04670 5C	W74-04654 2I	Mill Effluents, W74-04531 5D
PILOT PLANTS	POLAND (LAKE MIKOLAJSKIE) Morphological Variation of Keratella cochlearis	Electrolysis as a Purification Method for Ef-
Laboratory Study of Self-Sealing Limestone Plugs for Mine Openings,	(Gosse) (Rotatoria) in Several Masurian Lakes of Different Trophic Level,	fluents of the Pulp and Paper Industry (Die Elektrolyse als Reinigungsverfahren fuer Ab-
W74-04559 5G	W74-04696 5C	waesser der Papier- und Zellstoffindustrie), W74-04542 5D
PINK SALMON Bioassay Procedures to Evaluate Acute Toxicity of Neutralized Bleached Kraft Pulp Mill Ef-	POLARAGRAPHIC ANALYSIS Determination of the Complexing Capacity of Natural Water.	Physicochemical Processes for Water Quality Control,
fluent to Pacific Salmon,	W74-04312 2K	W74-04546 5E
W74-04779 5C	POLLUTANT IDENTIFICATION	Benefit of Water Pollution Control on Property Values,
Pink and Chum Salmon Culture, W74-04797 81	Mass Spectrometry and Inhomogeneous Ion Optics,	W74-04550 50
PIPELINES	W74-04475 5A	Skimmer Trap,
Permafrost Protection for Pipelines,	Air Pollution Measurements From Satellites,	W74-04713 50
W74-04415 2C	W74-04485 5A	Method and Apparatus for Treating Effluent, W74-04714
Permafrost-Related Engineering Geology Problems Posed by the Trans-Alaska Pipeline,	Determination of Chromium in Sea Water by Atomic Absorption Spectrometry,	Anti-Pollution Barge and Conveyer Assembly,
W74-04416 8D	W74-04516 5A	W74-04718 50

Apparatus for Treating Waste Fluids by Means of Dissolved Gases, W74-04719 5D	Analysis of Social and Cultural Renefits and Costs from Stream Control MeasuresPhase 4, W74-04311 6B	The Phytoplankton Productivity in the Pyasina River Near Tareya Village (Western Taimyr), (In Russian), W74-04698 21
POLYACRYLONITRILE Application of Polyacrylamide to Pulp Mill Ef-	PRECIPITATION (ATMOSPHERIC) Hydrology of the Central Arctic River Basins	Comparative Study, in 1966 and 1967, of Three
fluents (In Japanese), W74-04529 5D	of Alaska, W74-04304 2A	Reservoirs in the Project of a Natural Park in the Morvan Region (In French), W74-04815 5C
POLYMERS	PREDATION	
Mercury Removal from Waste Water with Starch Xanthate-Cationic Polymer Complex, W74-04541 5D	Effect of Light on Vulnerability of Heat- Stressed Sockeye Salmon to Predation by Coho Salmon, W74-04671 5C	PROFILES The Possibility of Forecasting Transient Coastal Relief Changes by Waves, W74-04436 2J
PORE PRESSURE		The Effect of Waves on the Profile of a Natu-
Soil Freezing in Relation to Pore Water Pressure and Temperature, W74-04381 2C	PRESSURE The Determination of Maximum Wave Velocities in the Shore Zone of the Sea,	ral Beach, W74-04620 2J
	W74-04437 2J	Beach Profiles of a Georgia Barrier Island,
Pore Water and Heaving Pressures Developed in Partially Frozen Soils, W74-04389 2C	PRESSURIZED WATER REACTOR Aerial Radiological Measuring Survey of the	W74-04736 2J PROGRAMMING LANGUAGES
Groundwater Pore Pressures Adjacent to Sub-	Area Surrounding the Robert Emmett Ginna Nuclear Power Plant, Ontario, New York,	Complete Listing of Program Described in Op- timal Operation of Multi-Reservoir Water
arctic Streams, W74-04393 2C	Sept. 8, 1970. W74-04446 5A	Resources Systems, W74-04315 4A
	BRIGING	
PORE WATER Soil Freezing in Relation to Pore Water Pres-	PRICING Evaluation of the Use of Pricing as a Tool for Conserving Water,	PROJECT BENEFITS Estimating the Benefits of Stream Valley and
sure and Temperature, W74-04381 2C	W74-04810 3D	Open Space Preservation Projects, W74-04500 6B
Ionio Mobility in Downsfront	PRIMARY PRODUCTION	Capitalization of the Benefits of Water
Ionic Mobility in Permafrost, W74-04382 2C	Relation Between the Amount of Net Zooplankton and the Depth of Station in Shal-	Resource Development, W74-04501 6B
POROSITY	low Lipno Reservoir,	Land Value Terrorete as a Manner of the
Effect of Porosity on Amount of Soil Water	W74-04680 5C	Land Value Increments as a Measure of the Net Benefits of Urban Water Supply Projects
Transferred in a Freezing Silt, W74-04376 2C	PRIMARY PRODUCTIVITY	in Developing Countries: Theory and Measure-
	Measurement of Adenosine Triphosphate (ATP) in Two Precambrian Shield Lakes of	ment, W74-04502 6B
POROUS MEDIA Effects of Salt Concentration Changes During	Northwestern Ontario,	Allocation of Funding for Wastewater Treat-
Freezing on the Unfrozen Water Content of Porous Materials,	W74-04782 5B	ment Facilities,
W74-04802 2C	Diurnal Variation of Dissolved Inorganic Car-	W74-04562 5D
BORRO	bon and its Use in Estimating Primary Produc- tion and CO2 Invasion in Lake 227,	PROJECT FEASIBILITY
PORTS Effect of Entrance on Seiche Motion in Ocean	W74-04784 5A	Cost-Benefit Analysis of Irrigation Projects in Northeastern Brazil,
Ports,	A Numerical Model for Determining Integral	W74-04565 3F
W74-04743 2L	Primary Production and Its Application to Lake	PROJECT PLANNING
POTATO	Michigan, W74-04786 5C	Economic Aspects of Ground Water Resources
Influence of Soil Moisture Conditions on		and Replacement Flows in Semiarid Agricul-
Growth and Development of the Potato Solanum tuberosum L.,	Production of Epilithiphyton in Two Lakes of the Experimental Lakes Area, Northwestern	tural Areas, W74-04563 4E
W74-04687 3F	Ontario,	Allocation of Scarce Resources to Agricultura
POTOMAC RIVER	W74-04787 5C	Research: Review of Methodology,
An Assessment of the Use of Potomac Estuary Waters and AWT Effluents for Emergency	Eutrophication of Lake 227 by Addition of	W74-04566 3F
Water Supply,	Phosphate and Nitrate: The Second, Third, and Fourth Years of Enrichment, 1970, 1971, and	PROPERTY VALUES
W74-04506 5D	1972,	Capitalization of the Benefits of Water Resource Development,
POWER SPECTRA	W74-04789 5C	W74-04501 6E
Investigation of Seiche Activity in West Coast	PRINTING INDUSTRY	Benefit of Water Pollution Control on Property
Harbors, W74-04744 2L	Water Pollution in the Netherlands, W74-04536 5B	Values,
		W74-04550 50
POWERPLANTS Suspended Sediment Due to Wave Action, W74-04747 2J	PRIOR APPROPRIATION Southwestern Groundwater Law: A Textual and Bibliographic Interpretation,	PROTEINS Finland Starts Production of Protein from Black Liquor.
PRE-IMPOUNDMENT	W74-04460 4B	W74-04526 5I
A Detailed Investigation of the Sociological,	PRODUCTION	
Economic, and Ecological Aspects of Proposed Reservoir Sites in the Salt River Basin of Kentucky.	Production Ability of Legumes, Grasses and Their Mixtures in Hill-Land Regions, W74-04694 4A	PROTOZOA Scanning Electron Microscopy of Fixed Frozen, and Dried Protozoa, W74-04497 76
W74-04310 2A		
Sociocultural Impact of Reservoirs on Local	PRODUCTIVITY Ecological Characteristics of Go-No-Ike Lake, W74-04638	PUBLIC HEALTH Community Water Supply. W74-04510 41

PUBLIC HEALTH

Problem of Isolating Salmonella from Surface	Application of Polyacrylamide to Pulp Mill Ef-	RADIOACTIVITY
Waters Exemplified by Long-Term Studies in	fluents (In Japanese), W74-04529 5D	One-Dimensional Model of the Movement of Trace Radioactive Solute Through Soil
the Berlin Area, Capital of the German Democratic Republic, (In German),		Columns: The Percol Model,
W74-04835 5A	Characteristics of Pulp and Paper Mill Wastes and ISI Standards,	W74-04444 5B
Ozonization as a Method of Purifying Water	W74-04530 5B	Aerial Radiological Measuring Survey of the
Polluted with Chemical Composition, (In Russian),	Low Cost Methods for Treating Pulp and Paper	Area Surrounding the Robert Emmett Ginna Nuclear Power Plant, Ontario, New York,
W74-04836 5D	Mill Effluents, W74-04531 5D	Sept. 8, 1970.
PUBLICATIONS		W74-04446 5A
Thermal Conditions in PermafrostA Review	Gravity Dewatering: Application to Paper Mill Wastes,	Aerial Radiological Measuring Survey of the
of North American Literature, W74-04347 2C	W74-04533 5D	Area Surrounding the Vermont Yankee Generating Station and the Yankee Nuclear
PUCCINIA-RECONDITA	Papermill Treatment Plant for Small Industry.	Power Station, September 18, 1970.
Relations Between Soil Water Potential and	W74-04534 5D	W74-04448 5A
Disease in Wheat Seedlings Infected by Puc-	Boise Cascade Paper Mill and St. Helens Share	Aerial Radiological Measuring Survey of the
cinia recondita, W74-04653 3F	Treatment Lagoon.	Area Surrounding the Point Beach Nuclear Plant, Two Creeks, Wisconsin, August 16 and
PULP AND PAPER INDUSTRY	W74-04535 5D	17, 1970.
Water Reuse and Deposits Control,	Study of Pulp and Paper Industry's Effluent	W74-04449 5A
W74-04520 5D	Treatment. W74-04538 5D	Environmental Surveillance for Fuel Fabrica-
Characteristics of Pulp and Paper Mill Wastes		tion Plants, W74-04451 5B
and ISI Standards,	1972 Review of the Literature on Pulp and Paper Effluent Management,	
W74-04530 5B	W74-04540 5D	Strontium-90 and Cesium-137 Levels in Soils of Various Types at Niigata Prefecture, Japan,
What's Wrong with Government Water Control	Electrolysis as a Purification Method for Ef-	W74-04453 5B
Programs and how They can be Improved, W74-04632 5D	fluents of the Pulp and Paper Industry (Die	Trans-Pacific Fallout and Protective Counter-
	Elektrolyse als Reinigungsverfahren fuer Ab-	measures,
PULP WASTES Color of Pulp Industry Waste Liquors. III. The	waesser der Papier- und Zellstoffindustrie), W74-04542 5D	W74-04454 5B
Interaction of Chloro-Oxylignin with Metal	Marine W. A. W. A. IV. A.C. C. V. J. A.C.	A Radiological Environmental Survey at EBR-
Salts (In Japanese),	Mill's Waste Water Used for Spray Irrigation. W74-04543 5D	II, W74-04455 5B
W74-04512 5D		
Aspects of Colour Removal from Pulp and	Solar Energy for the Concentration of Pulp Mill Effluents.	Environmental Radioactivity, W74-04456 5B
Paper Mill Effluents, W74-04514 5D	W74-04544 5D	
Mechanical Clarification of Industrial Waste	Processes for Reducing the Organic-Carbon	RADIOISOTOPES Aerial Radiological Measuring Survey of the
Waters (Mechanische Klaerung von Indus-	Content of Water Contaminated with Organic	Area Surrounding the La Crosse Boiling Water
trieabwaessern).	Compounds by Continuous Countercurrent Multistage Treatment with Activated Carbon,	Reactor, Genoa, Wisconsin, July 1968. W74-04447 5A
W74-04515 5D	W74-04704 5D	
Modern Waste Water Treatment and	Bioassay Procedures to Evaluate Acute Toxici-	Annual Consumption of Cesium-137 and Cobalt-60 Labeled Pine Seeds by Small Mam-
Processing Techniques in the Paper and Board Industry (Moderne Abwasseraufbereitungs-und	ty of Neutralized Bleached Kraft Pulp Mill Ef-	mals in an Oak-Hickory Forest,
Verfahrenstechnik in der Papier- und Kartonin-	fluent to Pacific Salmon, W74-04779 5C	W74-04450 5B
dustrie), W74-04517 5D		Radiological Status of the Groundwater
	QUICK CLAYS Quickclays as Products of Glacial Action: A	Beneath the Hanford Project, July-December
Paper Mill Sludge Disposal on Soils: Effects on the Yield and Mineral Nutrition of Oats (Avena	New Approach to Their Nature, Geology, Dis-	1972, W74-04452 5B
satival.),	tribution and Geotechnical Properties,	Laboratory Applications of Radioisotopic
W74-04519 5E	W74-04590 2G	Tracers to Follow Beach Sediments,
Effects of Condensates on the Toxicity of	RADAR Radio Depth-Sounding on Meighen and Barnes	W74-04751 2J
Kraft Pulp Mill Effluents, W74-04521 5D	Ice Caps, Arctic Canada,	A Study of Critical Depth and Mode of Sand
	W74-04571 2C	Movement Using Radioactive Glass Sand,
Willamette Cleanup, W74-04522 5D	RADIOACTIVE WASTE DISPOSAL	W74-04752 2J
	Environmental Monitoring and Disposal of Radioactive Wastes from U.S. Naval Nuclear-	RADIONUCLIDE MOVEMENT (SOILS) One-Dimensional Model of the Movement of
A New Secondary Treatment. W74-04524 5D	Powered Ships and Their Support Facilities,	Trace Radioactive Solute Through Soil
Extensive Effluent Treatment at Hodge In-	1972,	Columns: The Percol Model, W74-04444 5B
cludes Color Removal.	W74-04441 5B	
W74-04525 5D	A History and Preliminary Inventory Report on	RADIUM RADIOISOTOPES Distribution and Uptake of Artificially In-
Finland Starts Production of Protein from	the Kentucky Radioactive Waste Disposal Site, W74-04442 5B	Distribution and Uptake of Artificially In- troduced Radium-226 in a Small Lake,
Black Liquor.		W74-04785 5B
W74-04526 5D	Disposal of Radioactive Wastes, W74-04445 5D	RAINBOW TROUT
Clarification Method of Polluted Water from		Mercury Uptake and Ion Distribution in Gills
Paper Mills With Combination of Beer Effluent (In Japanese),	Industry Awaits Solutions to Problems of High- Level Radioactive-Waste Management,	of Rainbow Trout (Salmo gairdneri): Tissue Scans with an Electron Microprobe,
W74-04528 5D	W74-04457 5D	W74-04778 5A

Effects of Cadmium and Copper on the Oxida- tion of Lactate by Rainbow Trout (Salmo gaird-	A Refraction Study and Program for Periodic Waves Approaching a Shoreline, and Extend-	REMOTE SENSING Remote Sensing in Sampling Site Location in
nert) Gills,	ing Beyond the Breaking Point,	Lakes and Streams,
W74-04780 5C	W74-04340 8B	W74-04313 5A
RAINFALL-RUNOFF RELATIONSHIPS Statistical Analysis of Hydrograph Characteristics for Small Urban Watersheds,	The Effect of Wave Refraction on the Forma- tion of an Equilibrium Profile of Submarine Coastal Slope.	Electromagnetic Probing of Permafrost, W74-04400 2C
W74-04459 2A	W74-04438 2J	Potential Use of Airborne Dual-Channel In- frared Scanning to Detect Massive Ice in Per-
Linear Systems Technique Applied to Hydrologic Data Analysis and Instrument	Tracing Coastal Sediment Movement by Naturally Radioactive Minerals,	mafrost, W74-04403 7B
Evaluation: A Case Study on Data from the Alice Springs Area,	W74-04753 2J	Aerial Radiological Measuring Survey of the
W74-04470 2A	Modification of Wave Spectra on the Continen- tal Shelf and in the Surf Zone,	Area Surrounding the Robert Emmett Ginna Nuclear Power Plant, Ontario, New York,
RAINFED CROPS	W74-04762 2L	Sept. 8, 1970.
Rainfed Rice in Southern Senegal: Evaluation of Three Years' Experimentation (1966-1969),	REFRACTION (WATERWAVES)	W74-04446 5A
(In French), W74-04829 3F	Field Measurements of Swell Off the Island of Aruba,	Aerial Radiological Measuring Survey of the Area Surrounding the La Crosse Boiling Water
	W74-04723 2E	Reactor, Genoa, Wisconsin, July 1968.
RDX (CYCLONITE)	117-01/25	W74-04447 5A
A Proposal for the Investigation of Possible Ground-Water Contamination in the Bangor	REFUSE COMBUSTION Waste Automotive Lubricating Oil as a Mu-	Aerial Radiological Measuring Survey of the
Area, Kitsap County, Washington, W74-04491 5B	nicipal Incinerator Fuel,	Area Surrounding the Vermont Yankee Generating Station and the Yankee Nuclear
RECESSION CURVES	W74-04549 5D	Power Station, September 18, 1970. W74-04448 5A
Power Law Dependence on Time of River	REGIONAL ECONOMICS	
Flood Decay and Its Relationship to Long-	Institutional Framework Affecting the Use of	Aerial Radiological Measuring Survey of the
Term Discharge Frequency Distribution, W74-04806 4A	Inland Wetlands in Massachusetts, W74-04462 4A	Area Surrounding the Point Beach Nuclear Plant, Two Creeks, Wisconsin, August 16 and
RECHARGE	REGRESSION ANALYSIS	17, 1970. W74-04449 5A
Prediction of the 1972 Managua, Nicaragua,	Mathematical Modeling for Status Prediction	1170445
Earthquake from Groundwater Changes, In- ferred Probability of Earthquakes in the City of	and Control of Water Distribution Systems, W74-04320 4A	Air Pollution Measurements From Satellites, W74-04485 5A
Managua, Nicaragua, during the Summer of 1973,	Benefit of Water Pollution Control on Property	Cento Seminar on the Application of Remote
W74-04467 2F	Values, W74-04550 5G	Sensors in the Determination of natural Resources.
RECLAIMED WATER		W74-04567 7B
Social, Economic, Environmental, and Techni- cal Factors Influencing Water Reuse,	Soil Crusting Related to Sprinkler Intensity, W74-04560 3F	Possible Application of Remote Sensing for
W74-04317 5D	Application of Regression Analysis to Estima-	Underground Water Exploration in Turkey, W74-04568 7B
RECORDING INSTRUMENTS	tion of the Efficiency of Water Use in Irriga-	
Waves Off Benghazi Harbour - Libya, W74-04608 2L	tion (Opyt primeneniya regressionnogo analiza k otsenke effektivnosti ispol'zovaniya vody pri	Groundwater Investigation and Management in Iran,
	oroshenii),	W74-04569 7B
RECREATION DEMAND Multipurpose Reservoirs and Urban Develop-	W74-04580 3F	Operational and Experimental Remote Sensing
ment,	REGULATION	in Hydrology,
W74-04319 6B	State Environmental Management, Case Stu- dies of Nine States,	W74-04570 7B
RECYCLING	W74-04503 5G	Determination of Soil Moisture by Remote Sensing Techniques (Opredeleniye vlazhnosti
Social, Economic, Environmental, and Techni-		pochvy distantsionnymi aerokosmicheskimi
cal Factors Influencing Water Reuse, W74-04317 5D	Environmental Quality, The Fourth Annual Re- port of the Council on Environmental Quality.	metodami), W74-04576 2G
Water Reuse and Deposits Control,	W74-04504 5G	W/4-045/0
W74-04520 5D	Hydrogeologic Considerations in Solid Waste	Water Resources Applications, W74-04584 7B
Catalytic Oxidation and Thermal Treatment of	Storage in Iowa: Part 1. Sanitary Landfill Site	
Waste Waters (Kataliticheskoe okislenie i ter-	Selection: Part 2. A Method of Hazardous and Toxic Waste Disposal,	REPLACEMENT FLOW Economic Aspects of Ground Water Resources
micheskoe obezvrezhivanie stochnykh vod), W74-04537 5D	W74-04592 5E	and Replacement Flows in Semiarid Agricul-
RED CABBAGE	What's Wrong with Government Water Control	tural Areas, W74-04563 4B
Water Withdrawal by Plant Roots,	Programs and how They can be Improved, W74-04632 5D	REPRODUCTION
W74-04655 3F		Syngnathus nigrolineatus nigrolineatus
REFRACTION (WATER WAVES) Mean Direction of Waves and of Wave Energy,	State Standards for Temperature, (Issued by the Environmental Protection Agency in Au-	(Eichwald) in the Frasinet River and Mostistea Lake, (In Rumanian),
W74-04328 2J	gust 1972).	W74-04700 2I
Waves in Shoaling Water,	W74-04669 5G	REPUBLIC OF KOREA
W74-04338 8B	REGULATORY TECHNIQUE	The Need of Geological Investigations for the
	Managing Growth in a Fragile Environment:	Development of the Ground Water Resources
Shores and Shore Processes,	Problems of the Rocky Mountain States,	of the Republic of Korea, W74-04466 4B
W74-04339 2L	W74-04505 6D	W74-04466 4B

2L

RESEARCH

RESEARCH	REVIEWS	Rainfed Rice in Southern Senegal: Evaluation
Allocation of Scarce Resources to Agricultural Research: Review of Methodology, W74-04566 3F	Thermal Conditions in PermafrostA Review of North American Literature, W74-04347 2C	of Three Years' Experimentation (1966-1969), (In French), W74-04829 3F
117701300		
RESEARCH AND DEVELOPMENT Federal Water Resources Research Program for 1971.	Distribution of Permafrost in North America and Its Relationship to the Environment: A Review, 1963-1973,	RIP CURRENTS Longshore Currents in One and Multi-Bar Profiles Relation to Littoral Drift.
W74-04848 9D	W74-04353 2C	W74-04749 2L
RESEARCH NEEDS Research Needs and Priorities: Water Pollution Control Benefits and Costs, Vol. II,	Origin, Composition, and Structure of Perenni- ally Frozen Ground and Ground Ice: A Review, W74-04366 2C	RIPPLE MARKS Rhomboid Ripple Mark, Indicator of Current
W74-04465 5G	Considerate Investigations in Demograph Bo	Direction and Environment, W74-04739 21
	Groundwater Investigations in Permafrost Re- gions of North America: A Review,	1177137
RESEARCH PRIORITIES Research Needs and Priorities: Water Pollution Control Benefits and Costs, Vol. II.	W74-04391 2F	A Study of Critical Depth and Mode of Sand Movement Using Radioactive Glass Sand,
W74-04465 5G	Mapping and Predicting Permafrost in North America: A Review, 1963-1973, W74-04398 2C	W74-04752 21 RIPPLES
RESERVOIR CONSTRUCTION	W74-04398 2C	Certain Aspects of the Interaction Between
Reservoirs of Europe and Some Aspects of Their Construction and Multipurpose Use	Engineering Design and Construction in Permafrost Regions: A Review,	Wave Flow and a Deformable Bottom at Low Velocities.
(Vodokhranilishcha zarubezhnoy Yevropy i	W74-04404 8D	W74-04435 2J
nekotoryye voprosy ikh sozdaniya i komplek- snogo ispol'zovaniya),	State-of-Art Review: Water Pollution Control	
W74-04582 8A	Benefits and Costs, Vol I,	RISKS
	W74-04464 5G	Flood Proofing Decisions Under Uncertainty An Application to the Connecticut River Basin,
RESERVOIR OPERATION	What Do We Mean by Metropolitan Water	W74-04463 6A
Optimal Operation of Multi-Reservoir Water Resources Systems,	Management Institutions.,	
W74-04314 4A	W74-04498 6E	RIVER BASINS Hydrology of the Central Arctic River Basins
RESERVOIR SITES	Pollutant Removal Handbook, W74-04527 5D	of Alaska, W74-04304 2A
A Detailed Investigation of the Sociological,	#/4-0432/	W 74-04304
Economic, and Ecological Aspects of Proposed Reservoir Sites in the Salt River Basin of Ken- tucky.	Plant Responses to Water Stress, W74-04539 2I	Water Problems of the Tisza River in Hungary and Cooperation Among Tisza Basin Countries
W74-04310 2A	1972 Review of the Literature on Pulp and Paper Effluent Management,	in the Field of Water Management (Vodnyyo problemy reki Tisy v Vengrii i sotrudnichestvo
RESERVOIRS Vertical Distribution of Fishes Relative to	W74-04540 5D	stran basseyna Tisy v oblasti vodnogo khoz vayst va),
Physical, Chemical and Biological Features in	Reviewing Environmental Impact Statements-	W74-04574 4A
Two Central Arizona Reservoirs, W74-04474 5C	Power Plant Cooling Systems, Engineering Aspects, W74-04555 5G	Spring Runoff From Hillslopes, Smal Watersheds, and River Basins (Vesenniy stol
Reservoirs of Europe and Some Aspects of		so sklonov, malykh vodosborov, rechnykh bas
Their Construction and Multipurpose Use	Allocation of Scarce Resources to Agricultural	seynov),
(Vodokhranilishcha zarubezhnoy Yevropy i nekotoryye voprosy ikh sozdaniya i komplek-	Research: Review of Methodology, W74-04566 3F	W74-04577 21
snogo ispol'zovaniya), W74-04582 8A	Ground Water and the Geothermal Resource. W74-04586 4B	Water Quality Improvement in River Basin (Experience of Industrialized Countires) (Countires) (Countir
Water Quality Records for the Hubbard Creek	Hydrologic Investigation and Design in Urban	seynakh (Opyt industrial'nykh stran)),
Watershed, Texas, October 1969-September 1972, W74-04606 SB	AreasA Review, W74-04597 2A	W74-04583 50
	The Water Balance in Arctic and Subarctic Re-	Chemical Quality of Streams, Allegheny Rive Basin and Part of the Lake Erie Basin, Nev
A Report on the Limnology of Monroe Reservoir, Indiana,	gionsAnnotated Bibliography and Preliminary Assessment,	York, W74-04593 21
W74-04792 2H	W74-04601 2C	RIVER BEDS
Verification of Water Temperature Forecasts	Heat - A Growing Water Pollution Problem,	Effect of the Forest on the Displacement of the
for Deep, Stratified Reservoirs, W74-04807 4A	W74-04668 5B	Desna River Bed and the Significance of thi Effect on Forest Planting in the Floodplain, (I
RESINS	RHEOLOGY	Russian),
Effects of Condensates on the Toxicity of Kraft Pulp Mill Effluents.	Evaluation of in Situ Creep Properties of Frozen Soils with the Pressuremeter,	W74-04641 4/
W74-04521 5D	W74-04377 2C	RIVER SYSTEMS
RESISTIVITY	Viscoelastic Properties of Frozen Soil Under Vibratory Loads,	Topology of River Systems and Hydrographi Indicator Studies (Topologiya rechnykh sister
Geophysical Identification of Frozen and Un- frozen Ground, Antarctica,	W74-04388 8D	 i gidrograficheskiye indikatsionnyye iss ledovaniya),
W74-04360 2C	RICE	W74-04578 24
	Effects of Flooding and Draining and Their Al-	
RESOURCE ALLOCATION	ternation on the Growth and Uptake of	RIVERS The Fellows of Boor's Low or Cariolis' Effect
Allocation of Scarce Resources to Agricultural Research: Review of Methodology,	Nutrients by Rice (Oryza Sativa L., Indica Var. IR-8),	The Fallacy of Baer's Law or Coriolis' Effection the Meandering of Rivers,
W74-04566 3F	W74-04826 3F	W74-04799 8.

ROAD CONSTRUCTION	RURAL WATER SUPPLY	SALMONELLA SEROTYPES
Some Passive Methods of Controlling	Community Water Supply.	Salmonella Serotypes in Sewage of Various
Geocryological Conditions in Roadway Con-	W74-04510 4B	Origins, W74-04850 5B
struction, W74-04406 2C	RUTHENIUM	W/4-04630
	Radiological Status of the Groundwater	SALT BALANCE
Control of Permafrost Degradation Beneath a	Beneath the Hanford Project, July-December	New Dimensions in Estuary Classification,
Roadway by Subgrade Insulation,	1972,	W74-04735 2L
W74-04409 4C	W74-04452 5B	SALT RIVER BASIN (KY
Corps of Engineers Technology Related to	RYE	A Detailed Investigation of the Sociological,
Design of Pavements in Areas of Permafrost,	A Comparative Study of the Size and Recep-	Economic, and Ecological Aspects of Proposed
W74-04414 4C	tivity of the Stigma in Wheat, Rye, Triticale	Reservoir Sites in the Salt River Basin of Ken-
P	and Secalotricum,	tucky, W74-04310 2A
Encountering Massive Ground Ice During Road Construction in Central Alaska,	W74-04690 3F	W/4-04310
W74-04420 4C	CACAVANIBUTOV BIVER (AT ACVA)	SAMPLING
117 07120	A Groundwater Supply for an Oil Camp Near	Remote Sensing in Sampling Site Location in
The Use of Polyurethane Foam Plastics in the	Prudhoe Bay, Arctic Alaska,	Lakes and Streams,
Construction of Expedient Roads on Per-	W74-04396 2F	W74-04313 5A
mafrost in Central Alaska,		Sample Disturbance and Thaw Consolidation of
W74-04421 8G	SALINE ICE	a Deep Sand Permafrost,
ROCK MECHANICS	Ice EngineeringSummary of Elastic Proper-	W74-04387 2C
Mechanical Properties of Rocks at Low Tem-	ties Research and Introduction to Viscoelastic	Scanning Electron Microscopy of Fixed,
peratures,	and Nonlinear Analysis of Saline Ice,	Frozen, and Dried Protozoa,
W74-04380 2C	W74-04793 2C	W74-04497 7B
BOOTH MOUNTAIN BROWN	SALINE WATER	77.7.7.7.
ROCKY MOUNTAIN REGION	Application of Dynamic Programming in Mar-	The Effect of Collecting Time and Grain Size
Permafrost and Its Relationship to Other En-	kov Chains to the Evaluation of Water Quality	on the Sampling of Stream Sediments for
vironmental Parameters in a Midlatitude, High- Altitude Setting, Front Range, Colorado Rocky	in Irrigation,	Geochemical Mapping in the St. Catharines Area, Ontario,
Mountains.	W74-04561 3C	W74-04587 2J
W74-04357 2C		W/4-04307
	Effects of Salt Concentration Changes During Freezing on the Unfrozen Water Content of	A Bacteriological Pressure-Retaining Deep-Sea
Managing Growth in a Fragile Environment:	Porous Materials.	Sampler and Culture Vessel,
Problems of the Rocky Mountain States,	W74-04802 2C	W74-04773 5A
W74-04505 6D	1177 01002	SAN ANTONIO (TEX)
RODENTS	SALINE WATER-FRESHWATER INTERFACES	Optimal Operation of Multi-Reservoir Water
Annual Consumption of Cesium-137 and	The Nature of the Seawater-Freshwater Inter-	Resources Systems,
Cobalt-60 Labeled Pine Seeds by Small Mam-	face During Breakup in the Colville River	W74-04314 4A
mals in an Oak-Hickory Forest,	Delta, Alaska,	SAN FRANCISCO BAY (CA)
W74-04450 5B	W74-04397 2C	Constituent Transport in Estuaries,
DOMANIA	SALINE WATER INTRUSION	W74-04627 21
ROMANIA Syngnathus nigrolineatus nigrolineatus	The Nature of the Seawater-Freshwater Inter-	
(Eichwald) in the Frasinet River and Mostistea	face During Breakup in the Colville River	SAN JACINTO RIVER (TEX)
Lake, (In Rumanian),	Delta, Alaska,	Quantity and Chemical Quality of Low Flow in
W74-04700 2I	W74-04397 2C	the East Fork San Jacinto and West Fork San Jacinto Rivers near Houston, Texas, June 24
	74 Affi I Afi	26, 1969,
ROOTS	Phenomena Affecting Improvement of the	W74-04481 5E
Water Withdrawal by Plant Roots,	Lower Columbia Estuary and Entrance, W74-04763 2L	
W74-04655 3F	W/4-04/03	SAND BARS
ROTATORIA	SALINITY	Dynamics and Morphology of Sea Coasts. W74-04425
Morphological Variation of Keratella cochlearis	Comments on Veronis' Paper, 'On Properties	W /4-04425
(Gosse) (Rotatoria) in Several Masurian Lakes	of Seawater Defined by Temperature, Salinity,	Collective Movement of Sediment in Littora
of Different Trophic Level,	and Pressure',	Environment,
W74-04696 5C	W74-04658 2K	W74-04621 2
BOUCHNESS (SEA STIREACE)	Inshore Sea Surface Temperature and Salinity	Laboratory Study of Scale Effects in Two
ROUGHNESS (SEA-SURFACE) The Elevation, Slope, and Curvature Spectra of	Conditions at Agate Beach, Yaquina Bay and	Dimensional Beach Processes.
a Wind Roughened Sea Surface,	Whale Cove, Oregon, in 1970,	W74-04748 2I
W74-04476 2E	W74-04730 2L	
		Rhythmic Pattern of Longshore Bars Related to
RUBY MOUNTAINS (CANADA)	New Dimensions in Estuary Classification,	Sediment Characteristics, W74-04750 2.
Rates of Mass Wasting in the Ruby Range,	W74-04735 2L	W /4-04/30
Yukon Territory,	SALMON	SAND BYPASSING
W74-04371 2J	Effect of Light on Vulnerability of Heat-	Mechanical Bypassing of Littoral Drift at In
RUNOFF	Stressed Sockeye Salmon to Predation by Coho	lets,
Surface-Water Availability, Lauderdale Coun-	Salmon,	W74-04337 21
ty, Alabama,	W74-04671 5C	Application of Fluorescent Coated Sand in Lit
W74-04494 2E		toral Drift and Inlet Studies,
6 P	SALMONELLA ISOLATION	W74-04616 2I
Spring Runoff From Hillslopes, Small	Problem of Isolating Salmonella from Surface	
Watersheds, and River Basins (Vesenniy stok so sklonov, malykh vodosborov, rechnykh bas-	Waters Exemplified by Long-Term Studies in the Berlin Area, Capital of the German	SAND SPITS Developmental History and Present-Day
sevnov).	Democratic Republic, (In German),	Developmental History and Present-Day Dynamics of the Chushka Spit,
W74-04577 2E	W74-04835 5A	W74-04428 2

SAND SPITS

Recent Development of the Temryuk Coast on	SEA LEVEL Some Results of Regional Coastal Investiga-	Mechanical Bypassing of Littoral Drift at In- lets,
the Azov Sea, W74-04430 2J	tions in the USSR,	W74-04337 2L
W/4-04430	W74-04426 2J	
Shore Transport. Formation of Sand Spits and	Water of the Francisco of the Court of	Shores and Shore Processes,
Tombolos, W74-04722 2J	History of the Formation of the Coasts of Kara-Bogaz-Gol,	W74-04339 2L
W 14-04122 23	W74-04427 2J	Sediment Movement at Indian Ports,
SAND WAVES		W74-04345 2L
Submarine Sand Ridges as Indicators of	Some Data on the Post-Glacial Transgression	Developmental History and Present-Day
Longshore Migration of Sediments, W74-04434 2J	of the Bering Sea, W74-04431 2J	Dynamics of the Chushka Spit,
W /4-04434 23		W74-04428 2J
Collective Movement of Sediment in Littoral	Morphology and Evolution of aLagoon Coast	Submarine Sand Ridges as Indicators of
Environment,	on Sakhalin, W74-04433 2J	Longshore Migration of Sediments,
W74-04621 2J	W 14-04433	W74-04434 2J
SANDS	The Atlantic Coast of Long Island,	
Studies on the Validity of Darcy's Law for	W74-04626 8A	The Possibility of Forecasting Transient Coastal Relief Changes by Waves.
Flow in Natural Sands,	SEA WATER	W74-04436 2J
W74-04307 2F	Determination of Chromium in Sea Water by	117-0430
Triaxial and Creep Tests on Frozen Ottawa	Atomic Absorption Spectrometry,	The Role of Eolian Processes in the Dynamics
Sand,	W74-04516 5A	of a Shallow Accumulation Coast,
W74-04386 2C	Comments on Veronis' Paper, 'On Properties	W74-04440 2J
District No. 1 T. C	of Seawater Defined by Temperature, Salinity,	A Laboratory Investigation of Free Surface
Rhomboid Ripple Mark, Indicator of Current Direction and Environment.	and Pressure',	Flows Over Wavy Beds,
W74-04739 2J	W74-04658 2K	W74-04477 8B
	Hydrocarbon and Chlorophyll: A Correlation in	A Study on Mass Transport in Boundary
Development and Geologic Significance of Soft	the Upwelling Region off West Africa,	Layers in Standing Waves,
Beach Sand,	W74-04771 5B	W74-04615 2J
W74-04757 2J	Laboratory Chadian of the Assessmentation of	1 P 1 P
SANITARY ENGINEERING	Laboratory Studies of the Accommodation of Some Crude and Residual Fuel Oils in Sea	Application of Fluorescent Coated Sand in Lit- toral Drift and Inlet Studies,
An Experiment in Sanitary-Virological	Water,	W74-04616 2L
Research on Sewage, (In Russian),	W74-04775 5B	
W74-04849 5B	CEALANTE	Quantitative Tracing of Littoral Drift,
SANTA MONICA BAY (CALIF)	SEALANTS Laboratory Study of Self-Sealing Limestone	W74-04617 2J
Study of Beach Widening By the Perched	Plugs for Mine Openings,	Variable Dispersion and Its Effects on the
Beach Concept, Santa Monica Bay, California,	W74-04559 5G	Movements of Tracers on Beaches,
W74-04603 8B	CD 4 CON 4 N CD	W74-04618 2J
SATELLITES (ARTIFICIAL)	SEASONANCE Hurricane Storm Surge Considered as a	A Field Investigation of Sand Transport in the
Air Pollution Measurements From Satellites,	Resonance Phenomenon,	Surf Zone,
W74-04485 5A	W74-04332 2L	W74-04619 2J
Determination of Sail Maisture by Remote	SECALOTRIUM	Collective Movement of Sediment in Littoral
Determination of Soil Moisture by Remote Sensing Techniques (Opredeleniye vlazhnosti	A Comparative Study of the Size and Recep-	Environment,
pochyy distantsionnymi aerokosmicheskimi	tivity of the Stigma in Wheat, Rye, Triticale	W74-04621 2J
metodami),	and Secalotricum,	
W74-04576 2G	W74-04690 3F	Wave Period and the Swash Zone Energy
SCANNING ELECTRON MICROSCOPES	SECONDARY PRODUCTIVITY	Balance, W74-04622 2J
Scanning Electron Microscopy of Fixed,	Measurement of Adenosine Triphosphate	1174 01022
Frozen, and Dried Protozoa,	(ATP) in Two Precambrian Shield Lakes of	Littoral Drift as Function of Waves and Cur-
W74-04497 7B	Northwestern Ontario,	rent, W74-04623 2J
SCOUR	W74-04782 5B	W /4-04023 2J
Hydraulic Performance of BridgesExcava-	SEDIMENT CONTROL	Simulation of Horizontal Turbulent Diffusion
tions at Bridges,	Mudflows (Selevyye potoki),	of Particles Under Waves,
W74-04482 8B	W74-04581 4D	W74-04624 2J
CEA AID INTERACTION	SEDIMENT TRANSPORT	The Atlantic Coast of Long Island,
SEA-AIR INTERACTION A Review of Oceanographic Variables and	Growth of Longshore Currents Downstream of	W74-04626 8A
Their Analyses and Predictions Over the Con-	a Surf-Zone Barrier,	Constituent Transport in Patronia
tinental Shelf,	W74-04324 2J	Constituent Transport in Estuaries, W74-04627 2L
W74-04329 2L	The Relationship Between Wave Action and	
SEA ICE	Beach Profile Characteristics,	Shore Transport. Formation of Sand Spits and
Ice EngineeringSummary of Elastic Proper-	W74-04331 2J	Tombolos,
ties Research and Introduction to Viscoelastic	Littoral Transport in the Great Lakes,	W74-04722 2J
and Nonlinear Analysis of Saline Ice,	W74-04334 2J	Research in the Coastal and Oceanic Environ-
W74-04793 2C	-	ment. A Summary of Research Accomplished
SEA-LAND INTERACTION	Wave Effect on the Coast Formation and Ero-	Under Project Themis,
A Review of Oceanographic Variables and	sion, W74-04335 2J	W74-04732 2L
Their Analyses and Predictions Over the Con-		Eolian Cross-Bedding in the Beach Dune En-
tinental Shelf,	Theoretical Forms of Shorelines,	vironment, Sapelo Island, Georgia,
W74-04329 2L	W74-04336 2J	W74-04737 2J

Rhomboid Ripple Mark, Indicator of Current	The Effect of Waves on the Profile of a Natu-	SEWAGE
Direction and Environment,	ral Beach,	An Experiment in Sanitary-Virological
W74-04739 21	W74-04620 2J	Research on Sewage, (In Russian), W74-04849 5B
Flume Experiments on Sand Transport by	Sedimentation Tanks,	W74-04849 5B
Waves and Currents,	W74-04708 5D	Salmonella Serotypes in Sewage of Various
W74-04746 2I		Origins,
	Sedimentation in Hawke Bay,	W74-04850 5B
Suspended Sediment Due to Wave Action,	W74-04726 2L	SEWAGE BACTERIA
W74-04747 2		Lime Disinfection of Sewage Bacteria at Low
Rhythmic Pattern of Longshore Bars Related to	Studies of a Southern Fiord. W74-04727 2J	Temperature.
Sediment Characteristics,	W14-04121	W74-04548 5D
W74-04750 2	Drastic Beach Changes in a Low-Energy En-	SEWAGE DISPOSAL
Laboratory Applications of Radioisotopic	vironment Caused by Hurricane Betsy,	Mixing Processes,
Tracers to Follow Beach Sediments,	W74-04756 2J	W74-04327 5B
W74-04751 2	CERTIFICATION OF THE PARTY OF T	
	Delectudes and Sedimental and California	SEWAGE TREATMENT
A Study of Critical Depth and Mode of San	Missoula Flooding in Eastern Washington,	A Sewage-Treatment Concept for Permafrost
Movement Using Radioactive Glass Sand, W74-04752	31774 04500	Areas, W74-04419 5D
W74-04752 2	22	W /4-04419 3D
Tracing Coastal Sediment Movement by Natu		Boise Cascade Paper Mill and St. Helens Share
rally Radioactive Minerals,	The Effect of Collecting Time and Grain Size	Treatment Lagoon.
W74-04753 2	on the Sampling of Stream Sediments for	W74-04535 5D
Some Characteristics of the Dutch Coast,	Geochemical Mapping in the St. Catharines	Lime Disinfection of Sewage Bacteria at Low
	Area, Ontario, J W74-04587 2J	Temperature.
11770754	W/4-0436/	W74-04548 5D
Similarity in Sediment Transport Due t	Sedimentation in Hawke Bay,	
Waves,	W74-04726 2L	Method and Apparatus for Treating Effluent,
W74-04755		W74-04714 5D
Phenomena Affecting Improvement of th	Nucleonic Sediment Concentration Gauge -	Method of Treating Sewage Using High
Lower Columbia Estuary and Entrance,	Comparison of Transmission and Scattering Modes.	Polymer Ratio Flocculation Agent Biologically
W74-04763 2	W74-04774 2J	Produced in Situ,
The Colombian of Chical Distance Volume		W74-04717 5D
The Calculation of Critical Discharge Velocit of Streams in Uniform Flow and the Trans		SEWERAGE
ported Sediment Size,	Chromatographic Determination of Dissolved	Syracuse Metropolitan Area Comprehensive
	Inorganic and Organic Carbon in Fresh Water	Plan-Water and Sewer Plan and Services Allo-
	and Carbonates in Sediments,	cation Plan,
The Problem of Critical Discharge in Sedimer	t W74-04788 5A	W74-04507 5D
Motion,	T SEICHES	Prattville, Alabama Community Development
W74-04801	Effect of Entrance on Seiche Motion in Ocean	Plan, Vol. II: Summary and Illustrations.
Suspended and Bedload Sediment Transport i		W74-04508 5D
the Snake and Clearwater Rivers in the Vicinit	y W74-04743 2L	Maurice and Manning References
of Lewiston, Idaho,	* * * * * * * * * * * * * * * * * * *	Housing and Planning References. W74-04511 3D
W74-04846	J Investigation of Seiche Activity in West Coast	W/4-04511
SEDIMENTARY STRUCTURES	Harbors, W74-04744 2L	SHADOW PRICES
Certain Aspects of the Interaction Between		Cost-Benefit Analysis of Irrigation Projects in
Wave Flow and a Deformable Bottom at Lo	W SEISMIC STUDIES	Northeastern Brazil, W74-04565 3F
Velocities,	Geophysical Identification of Frozen and Un-	W74-04565 3F
W74-04435	J frozen Ground, Antarctica,	SHALLOW WATER
SEDIMENTATION	W74-04360 2C	Harmonic Generation of Shallow Water Waves
Dynamics and Morphology of Sea Coasts.	Mechanical Properties of Frozen Ground	Over Topography,
	J Under High Pressure,	W74-04323 2E
	W74-04375 2C	Wave Effect on the Coast Formation and Ero-
Some Data on the Post-Glacial Evolution		sion,
Karkinit Bay and the Accumulation of Botto		W74-04335 2J
Sediments Within it, W74-04429	Mapping of Frozen Surficial Materials, W74-04401	Wayne in Chapling Water
11707127	W74-04401 2C	Waves in Shoaling Water, W74-04338 8B
Recent Development of the Temryuk Coast of	n SELF PURIFICATION	
the Azov Sea,	Role of Phyto- and Zooplankton in Self-Purifi-	A Refraction Study and Program for Periodic
W74-04430	cation Processes (Exemplified by Oxidation	Waves Approaching a Shoreline, and Extend-
Some Data on the Post-Glacial Transgression	n Ponds), (In Russian),	ing Beyond the Breaking Point, W74-04340 8B
of the Bering Sea,	W74-04692 5G	11 /4-04340
	SEMIARID CLIMATES	The Determination of Maximum Wave Veloci
Castoin Standard and Development Com-	Francis Assets of Count Water Decourses	ties in the Shore Zone of the Sea,
Certain Structural and Developmental Coast Features in the South of the Maritime Territ		W74-04437 2
reatures in the South of the Maritime Territory,	tural Areas,	The Possibility of Predicting Longshore Cur
	U W74-04563 4B	rents in Tideless Seas,
		W74-04439 2.
Morphology and Evolution of aLagoon Coa	SETTLING TANKS Sedimentation Tanks.	Waves at Camp Pendleton, California,
on Sakhalin, W74-04433	J W74-04708 SD	W74-04607 Pendleton, California,

SHALLOW WATER

Shallow Water Waves: A Comparison of Theo-	SHEAR	Some Data on the Post-Glacial Evolution of
ries and Experiments, W74-04609 2E	Convective Heat Transfer to Water Containing Bubbles: Enhancement not Dependent on Ther-	Karkinit Bay and the Accumulation of Bottom Sediments Within it,
	mocapillarity,	W74-04429 2J
Breaking Wave Criteria; A Study Employing a Numerical Wave Theory,	W74-04664 8B	Morphology and Evolution of aLagoon Coast
W74-04610 2E	SHEAR STRESS Shear Velocity in a Tidal Estuary,	on Sakhalin, W74-04433 2J
Hyperbolic Waves and Their Shoaling,	W74-04629 2L	W 74-04-33
W74-04611 2E		The Determination of Maximum Wave Veloci-
De la Francia Charles and Warre	SHEAR VELOCITY Shear Velocity in a Tidal Estuary,	ties in the Shore Zone of the Sea, W74-04437 2J
Effect of Beach Slope and Shoaling on Wave Asymmetry,	W74-04629 2L	
W74-04612 2E	SHEEP (FEEDING)	The Effect of Wave Refraction on the Forma- tion of an Equilibrium Profile of Submarine
The Effects of Bottom Confirmation on the	Drought and Supplementary Feeding of Sheep	Coastal Slope,
The Effects of Bottom Configuration on the Deformation, Breaking and Run-Up of Solitary	in the Karoo,	W74-04438 2J
Waves,	W74-04834 3F	The Possibility of Predicting Longshore Cur-
W74-04613 2E	SHIPS	rents in Tideless Seas,
Wave Reflection and Transmission in Channels	Environmental Monitoring and Disposal of Radioactive Wastes from U.S. Naval Nuclear-	W74-04439 2J
of Variable Section,	Powered Ships and Their Support Facilities,	Waves and Tides Near the Shore,
W74-04614 8B	1972,	W74-04758 2L
A Study on Mass Transport in Boundary	W74-04441 5B	SIDEROCOCCUS
Layers in Standing Waves,	SHOALING	Overgrowth of Ooze Iron-Manganese Microor-
W74-04615 2J	The Solitary Wave,	ganisms Studied by Electron Microscopy, (In Russian),
Variable Dispersion and Its Effects on the	W74-04326 8B	W74-04558 5A
Movements of Tracers on Beaches,	Mean Direction of Waves and of Wave Energy,	
W74-04618 2J	W74-04328 2J	SILT Influences of Soil Density, Clay Silt and
Use of a Computational Model for Two-Dimen-	Waves in Shoaling Water,	Humus Content on Measurements of Soil
sional Tidal Flow,	W74-04338 8B	Water by Neutron Gauges, (In German),
W74-04631 2L	Hyperbolic Waves and Their Shoaling,	W74-04556 2G
Shore Transport. Formation of Sand Spits and	W74-04611 2E	SILTS
Tombolos,	Effect of Beach Slope and Shoaling on Wave	Thaw Consolidation of Alaskan Silts and
W74-04722 2J	Asymmetry,	Granular Soils, W74-04379 2C
Research in the Coastal and Oceanic Environ-	W74-04612 2E	
ment. A Summary of Research Accomplished	The Effects of Bottom Configuration on the	SILVER/SULFIDE ELECTRODES
Under Project Themis, W74-04732 2L	Deformation, Breaking and Run-Up of Solitary	Use of a Silver-Sulfide Electrode for Stan- dardizing Aqueous Sulfide Solution in Deter-
	Waves, W74-04613 2E	mining Sulfide in Water,
Flume Experiments on Sand Transport by		W74-04777 5A
Waves and Currents, W74-04746 2L	SHOALS Waves in Shoaling Water,	SIMULATION ANALYSIS
	W74-04338 8B	Evaluation and Simulation of Chemical-Quality
Suspended Sediment Due to Wave Action, W74-04747 2J	OWOOD WANDS	Data for Five Montana Sampling Stations, W74-04484 2K
W74-04747 2J	SHOCK WAVES Shock-Wave Studies of Ice and Two Frozen	
Laboratory Study of Scale Effects in Two-	Soils,	A Simulation Model for Evaluating Irrigation
Dimensional Beach Processes, W74-04748 21.	W74-04378 2C	Management Practices, W74-04564 3F
W74-04748 2L	Sound and Shock Transmission in Frozen	
Rhythmic Pattern of Longshore Bars Related to	Soils,	The Use of Computer Simulations for Systems Ecological Studies in the Baltic,
Sediment Characteristics,	W74-04383 2C	W74-04634 5B
W74-04750 2J	SHORE PROCESSES	The Application of Numerical Simulation
A Study of Critical Depth and Mode of Sand	SURF,	Models in the Assessment of the Effect of
Movement Using Radioactive Glass Sand, W74-04752 2J	W74-04725 2J	Discharges into Coastal Waters,
W74-04752 2J	SHORE PROTECTION	W74-04674 5B
Some Characteristics of the Dutch Coast,	The Relationship Between Wave Action and	SKIMMING
W74-04754 2J	Beach Profile Characteristics, W74-04331 2J	Skimmer Trap,
Approximate Estimations of Correlation Coef-		W74-04713 5G
ficient Between Wave Height and Period of	The Atlantic Coast of Long Island, W74-04626 8A	SLIME
Shallow Water Wind Waves, W74-04761 2L		Water Reuse and Deposits Control,
W74-04761 2L	Floating Breakwater Pontoon, W74-04711 8B	W74-04520 5D
Modification of Wave Spectra on the Continen-	W74-04711 8B	SLOPES
tal Shelf and in the Surf Zone,	SHORELINES	The Possibility of Forecasting Transient
W74-04762 2L	Theoretical Forms of Shorelines, W74-04336 2J	Coastal Relief Changes by Waves, W74-04436 2J
Propagation of a Finite-Amplitude Surface		
Wave With Allowance for Random Irregularities of the Bottom	SHORES Theoretical Forms of Shorelines	The Determination of Maximum Wave Veloci-
ties of the Bottom, W74-04841 2J	Theoretical Forms of Shorelines, W74-04336 2J	ties in the Shore Zone of the Sea, W74-04437 2J
-		

The Effect of Wave Refraction on the Forma- tion of an Equilibrium Profile of Submarine	SNOWMELT Effects of Stratigraphic Layers on Water Flow	A Radiological Environmental Survey at EBR- II,
Coastal Slope,	Through Snow,	W74-04455 5B
W74-04438 2J	W74-04572 2C	
		SOIL DENSITY
Spring Runoff From Hillslopes, Small	SNOWPACKS	Influences of Soil Density, Clay Silt and
Watersheds, and River Basins (Vesenniy stok	Effects of Stratigraphic Layers on Water Flow	Humus Content on Measurements of Soil
so sklonov, malykh vodosborov, rechnykh bas-	Through Snow,	Water by Neutron Gauges, (In German),
seynov), W74-04577 2E	W74-04572 2C	W74-04556 2G
W74-04577 2E	Water Flow Through Snow Overlying an Im-	SOIL DISPOSAL FIELDS
Slope Development on a Mississippi River	permeable Boundary,	Land Disposal of Waste Gases: 1. Flow Analy-
Bluff in Historic Time,	W74-04803 2C	sis of Gas Injection Systems,
W74-04585 2J	1177-01005	W74-04479 SE
	SOCIAL ADJUSTMENT	
High-Angle Beach Stratification, Sapelo Island,	A Detailed Investigation of the Sociological,	Land Disposal of Waste Gases: II. Gas Flow
Georgia,	Economic, and Ecological Aspects of Proposed	from Buried Pipes,
W74-04738 2J	Reservoir Sites in the Salt River Basin of Ken-	W74-04480 5E
Waves and Tides Near the Shore,	tucky,	Paper Mill Sludge Disposal on Soils: Effects on
W74-04758 2L	W74-04310 2A	the Yield and Mineral Nutrition of Oats (Avena
	COCIAL ACRECTE	satival.),
SLUDGE DISPOSAL	SOCIAL ASPECTS	W74-04519 5E
Paper Mill Sludge Disposal on Soils: Effects on	Social, Economic, Environmental, and Techni- cal Factors Influencing Water Reuse,	
the Yield and Mineral Nutrition of Oats (Avena	W74-04317 5D	Mill's Waste Water Used for Spray Irrigation.
satival.),	W/4-0431/	W74-04543 5D
W74-04519 5E	SOCIAL CHANGE	SOIL FORMATION
SLUDGE TREATMENT	Sociocultural Impact of Reservoirs on Local	Soil Development and Patterned Ground
Gravity Dewatering: Application to Paper Mill	Government Institutions, Anthropological	Evolution in Beacon Valley Antarctica,
Wastes.	Analysis of Social and Cultural Benefits and	W74-04372 2G
W74-04533 5D	Costs from Stream Control MeasuresPhase 4,	
	W74-04311 6B	SOIL MECHANICS
Trickling Filter-Activated Sludge Combinations	COCTAT THE CO	Mechanical Properties of Frozen Ground
for Domestic Wastewater Treatment,	SOCIAL IMPACT	Under High Pressure,
W74-04798 5D	Sociocultural Impact of Reservoirs on Local	W74-04375 2C
SMALL WATERSHEDS	Government Institutions, Anthropological	SOIL MOISTURE
Spring Runoff From Hillslopes, Small	Analysis of Social and Cultural Benefits and Costs from Stream Control MeasuresPhase 4,	The Unfrozen Water and the Apparent Specific
Watersheds, and River Basins (Vesenniy stok	W74-04311 6B	Heat Capacity of Frozen Soils,
so sklonov, malykh vodosborov, rechnykh bas-	W/4-04311 0B	W74-04374 2C
seynov),	SOCIAL VALUES	
W74-04577 2E	What Do We Mean by Metropolitan Water	Soil Crusting Related to Sprinkler Intensity,
	Management Institutions.,	W74-04560 3F
Hydrologic Data for Small Rural Catchments in	W74-04498 6E	A Simulation Model for Evaluating Irrigation
Australia, 1973, W74-04842 2E	ACCUPATE CALLACAT	Management Practices,
W74-04842 2E	SOCKEYE SALMON	W74-04564 3F
SNAILS	Bioassay Procedures to Evaluate Acute Toxici- ty of Neutralized Bleached Kraft Pulp Mill Ef-	31
Ecological Investigations of Ponds with Special	fluent to Pacific Salmon,	Determination of Soil Moisture by Remote
Regard to the Consequences of Water Pollution	W74-04779 5C	Sensing Techniques (Opredeleniye vlazhnosti
by Oil, (In German),	W/4-04/7/	pochvy distantsionnymi aerokosmicheskimi
W74-04635 5C	SODIUM COOLING	metodami),
	Breeder Reactors: Power for the Future,	W74-04576 2G
SNAKE RIVER (IDA)	W74-04656 8C	Influence of Soil Maintain Condition
Suspended and Bedload Sediment Transport in		Influence of Soil Moisture Conditions on Growth and Development of the Potato
the Snake and Clearwater Rivers in the Vicinity	SOFT BEACH SAND	Solanum tuberosum L.,
of Lewiston, Idaho, W74-04846 2J	Development and Geologic Significance of Soft	W74-04687 3F
117-01010	Beach Sand,	r o too
SNOW	W74-04757 2J	Potential Intensity of Photosynthesis in Some
Polluted Snow in Southern Norway During the	SOIL ANALYSIS	Tomato and Beet Species Under Different Soil
Winters 1968-1971,	Spectrophotometric Estimation of Arsenic in	Moisture, (In Russian),
W74-04652 5B	Nitric Acid Extracts of Soil and Soil Additives,	W74-04691 3F
	W74-04769 5A	Water Desires in Albertial For Sails of the
SNOW ACCUMULATION	WITTONIO JA	Water Regime in Alluvial Fan Soils of the
Accumulation on the Devon Island Ice Cap,	SOIL CHEMICAL PROPERTIES	Araks River, (In Russian), W74-04733 2G
Northwest Territories, Canada, W74-04325 2C	One-Dimensional Model of the Movement of	W 14-04/33
W 74-04323 2C	Trace Radioactive Solute Through Soil	Water Conditions in Soils of the Bogar Zone of
SNOW COVER	Columns: The Percol Model,	the Uzbek SSR,
Indirect Mapping of the Snowcover for Per-	W74-04444 5B	W74-04809 2G
mafrost Prediction at Schefferville, Quebec,	COST CONTANTANTON	
W74-04356 2C	SOIL CONTAMINATION	Nutrient Uptake by Winter Wheat in a Zone of
	One-Dimensional Model of the Movement of	Unstable Moisture, (In Russian),
Permafrost and Snowcover Relationships Near	Trace Radioactive Solute Through Soil	W74-04827 3F
Schefferville,	Columns: The Percol Model, W74-04444 5B	SOIL MOISTURE DEPLETION
W74-04362 2C	W74-04444 5B	Influence of Environmental Moisture Condi-
Studies at the Timmins 4 Permafrost Experi-	Strontium-90 and Cesium-137 Levels in Soils of	tions on the Phenol Compound Amount in Cal-
mental Site.	Various Types at Niigata Prefecture, Japan,	luna Vulgaris L.,
W74-04363 2C	W74-04453 5B	W74-04487 21

SOIL PHYSICAL PROPERTIES

Shock-Wave Studies of Ice and Two Frozen	Solid-Waste Disposal in West-Central Florida,	Forcement of Physiological Process in Cotton
Soils, W74-04378 2C	W74-04605 5E	Plants, W74-04823 3F
	SOLIFLUCTION	
Sound and Shock Transmission in Frozen Soils,	Rates of Mass Wasting in the Ruby Range, Yukon Territory,	SPRINKLER IRRIGATION Soil Crusting Related to Sprinkler Intensity,
W74-04383 2C	W74-04371 2J	W74-04560 3F
SOIL STRENGTH	SOLITARY WAVES	Water Consumption and Biological Coefficient
Viscoelastic Properties of Frozen Soil Under	The Solitary Wave,	of Furrow and Sprinkler Irrigated Cotton, (In
Vibratory Loads,	W74-04326 8B	Bulgarian), W74-04824 3F
W74-04388 8D	The Effects of Bottom Configuration on the	W 14-04824 3F
Shear Strength at a Thaw Interface,	Deformation, Breaking and Run-Up of Solitary	SPRINKLING
W74-04390 2C	Waves,	Soil Crusting Related to Sprinkler Intensity,
SOIL TESTS	W74-04613 2E	W74-04560 3F
Triaxial and Creep Tests on Frozen Ottawa	Propagation of a Finite-Amplitude Surface	ST
Sand,	Wave With Allowance for Random Irregulari-	Summary Report of Metromex Studies, 1971-
W74-04386 2C	ties of the Bottom,	1972.
Sample Disturbance and Thaw Consolidation of	W74-04841 2J	W74-04509 2B
a Deep Sand Permafrost,	SOUND WAVES	STABILITY
W74-04387 2C	Sound and Shock Transmission in Frozen	On the Stability of Laminar Plumes: Some Nu-
SOIL TYPES	Soils,	merical Solutions and Experiments, W74-04662 5B
Role of Soil Conditions in the Development of	W74-04383 2C	W74-04662 5B
Moths, (In Russian),	SOUNDING	STANDING WAVES
W74-04640 3F	Radio Depth-Sounding on Meighen and Barnes	A Study on Mass Transport in Boundary
SOIL WATER	Ice Caps, Arctic Canada,	Layers in Standing Waves, W74-04615 2J
Effect of Porosity on Amount of Soil Water	W74-04571 2C	W 14-04013
Transferred in a Freezing Silt,	SOUNDS	STARCH DERIVATIVES
W74-04376 2C	Studies of a Southern Fiord.	Mercury Removal from Waste Water with
Influences of Soil Density, Clay Silt and	W74-04727 2J	Starch Xanthate-Cationic Polymer Complex, W74-04541 5D
Humus Content on Measurements of Soil	SOUTHEAST U	35
Water by Neutron Gauges, (In German),	Development and Geologic Significance of Soft	STATE GOVERNMENTS
W74-04556 2G	Beach Sand,	State Environmental Management, Case Stu- dies of Nine States,
SOIL WATER MOVEMENT	W74-04757 2J	W74-04503 5G
Phosphorus Relationships in Runoff from Fer-	SOUTHWEST U	
tilized Soils,	Southwestern Groundwater Law: A Textual	State Standards for Temperature, (Issued by
W74-04471 5B	and Bibliographic Interpretation,	the Environmental Protection Agency in August 1972).
Measurement of Moisture Diffusivity of Wet	W74-04460 4B	W74-04669 5G
Swelling Systems,	SPAS	
W74-04493 2G	Some Problems Involved in Optimal Protection	STATE JURISDICTION State Environmental Management, Case Stu-
SOIL-WATER-PLANT RELATIONSHIPS	of the Environment in Spas,	dies of Nine States,
Plant Responses to Water Stress,	W74-04847 5G	W74-04503 5G
W74-04539 2I	SPAWNING	CTATICTICAL MODELS
SOIL WATER POTENTIAL	Sex Cycle, Spawning and Fertility of West	STATISTICAL MODELS Multi-Dimensional Aspects of Eddy Diffusion
Relations Between Soil Water Potential and	Siberian Crucians in the Steppe Lakes, (In Rus-	Determined by Dye Diffusion Experiments in
Disease in Wheat Seedlings Infected by Puc-	sian),	Coastal Waters (Summary),
cinia recondita,	W74-04689 2H	W74-04322 2L
W74-04653 3F	SPECIFIC CONDUCTIVITY	Statistical Analysis of Hydrograph Charac-
SOILS	Lakes in the Boulder-Fort Collins-Greeley	teristics for Small Urban Watersheds,
Micro- and Mesobenthos Development as a	Area, Front Range Urban Corridor, Colorado, W74-04496 2H	W74-04459 2A
Factor of Soil Composition (In Russian), W74-04816 2H	W74-04496 2H	STIGMA
	SPECTROPHOTOMETRY	A Comparative Study of the Size and Recep-
SOLAR DISTILLATION	Analytical Techniques for the Determination of	tivity of the Stigma in Wheat, Rye, Triticale
Solar Energy for the Concentration of Pulp Mill Effluents.	Petroleum Contamination in Marine Organisms, W74-04594 5A	and Secalotricum, W74-04690 3F
W74-04544 5D		W74-04690 3F
-	Spectrophotometric Estimation of Arsenic in	STOCHASTIC PROCESSES
Solar Distillation Apparatus,	Nitric Acid Extracts of Soil and Soil Additives, W74-04769 5A	The Operation of a Stream-Aquifer System
W74-04720 3A	W74-04769 5A	Under Stochastic Demands, W74-04808 4B
SOLAR RADIATION	SPECTROSCOPY	11.1-01000 4B
Solar Energy for the Concentration of Pulp Mill	Determination of Chromium in Sea Water by	STOMATA
Effluents, W74-04544 5D	Atomic Absorption Spectrometry, W74-04516 5A	Changes in Enzymes in the Plant as Related to Water Supply and Usage.
W74-04544 5D	W74-04516 5A	W74-04306 Usage,
SOLID WASTES	SPRAY IRRIGATION	
A History and Preliminary Inventory Report on the Kentucky Radioactive Waste Disposal Site.	Survey of Facilities Using Land Application of Wastewater.	STORAGE
W74-04442 SB	W74-04677 5D	Approaches to Stormwater Management, W74-04458 5A

SURFACE-GROUNDWATER RELATIONSHIPS

STORAGE REQUIREMENTS Mathematical Modeling of Stream Storage	STRENGTH OF MATERIALS Mechanical Properties of Rocks at Low Tem-	SUBURBAN WATERSHEDS Management of Stormwater Runoff in Suburban Environments,
Potential, W74-04305 2E	peratures, W74-04380 2C	W74-04302 5D
CHORAL PUNCEE	CERTATED CROUND	SUCCESSION (PLANTS)
STORM RUNOFF Management of Stormwater Runoff in Subur-	STRIATED GROUND Striated Ground, A Type of Patterned Ground	Observations on the Vegetation of the
ban Environments, W74-04302 5D	in the Periglacial Area of the Venezuelan Andes, (In Spanish),	Koronowo Reservoir, W74-04654 21
	W74-04651 2G	arian aan
Approaches to Stormwater Management,	OND CAMPAINA	SUCROSE Heterotrophic Utilization of Sucrose in an Ar-
W74-04458 5A	STRONTIUM	tificially Enriched Lake,
Hypochlorination of Polluted Storm-Water	Strontium-90 and Cesium-137 Levels in Soils of Various Types at Nijgata Prefecture, Japan.	W74-04781 5C
Pumpage at New Orleans,	W74-04453 5B	***************************************
W74-04676 5D	W/4-0433	SULFATES
	SUBARCTIC REGIONS	Color Removal from Textile Dye Waste by
STORM SURGE	The Water Balance in Arctic and Subarctic Re-	Coagulation,
Hurricane Storm Surge Considered as a	gionsAnnotated Bibliography and Preliminary	W74-04303 5D
Resonance Phenomenon,	Assessment,	Effects of Toxicants on Brackish-Water
W74-04332 2L	W74-04601 2C	Phytoplankton Assimilation,
Hurricane Tide Prediction for New York Bay,	SUBGLACIAL DEVELOPMENT	W74-04644 5C
W74-04343 2L	Subglacial Development of Chlorella in Baikal,	
	(In Russian),	SULFIDES
Numerical Computations of Storm Surges with	W74-04647 2H	Use of a Silver-Sulfide Electrode for Stan-
Bottom Stress,	W/4-0404/	dardizing Aqueous Sulfide Solution in Deter-
W74-04759 2L	SUBMARINE SAND RIDGES	mining Sulfide in Water,
STORMS	Submarine Sand Ridges as Indicators of	W74-04777 5A
The Atlantic Coast of Long Island,	Longshore Migration of Sediments,	SULFUR
W74-04626 8A	W74-04434 2J	Polluted Snow in Southern Norway During the
W 74-04020	aveau aveau	Winters 1968-1971,
Field Measurements of Swell Off the Island of	SUBSIDENCE	W74-04652 5B
Aruba,	Thaw Consolidation of Alaskan Silts and Granular Soils.	
W74-04723 2E	W74-04379 2C	Analysis of Trace Elements, Phosphorus and
CTODAGE ATER MANAGEMENT	W/4-043/9	Sulphur, in the Lipid and the Non-Lipid Phase
STORMWATER MANAGEMENT	Practical Extensions to a Theory of Consolida-	of Halibut (Hippoglossus hippoglossus) and
Approaches to Stormwater Management, W74-04458 5A	tion for Thawing Soils,	Tunny (Thunnus thynnus),
W74-04458 5A	W74-04384 2C	W74-04770 5A
STRATIFICATION	Company Maked of Controlling	SULFUR COMPOUNDS
Estuaries,	Some Passive Methods of Controlling Geocryological Conditions in Roadway Con-	Hydrogen Peroxide for Industrial Pollution
W74-04321 2L	struction,	Control,
	W74-04406 2C	W74-04532 5D
New Dimensions in Estuary Classification,	1171 01100	SURF
W74-04735 2L	Environmental Considerations for the Utiliza-	SURF.
High-Angle Beach Stratification, Sapelo Island,	tion of Permafrost Terrain,	W74-04725 2J
Georgia,	W74-04407 2C	1111112
W74-04738 2J	Cattlement Associated with the Themine of Box	Inshore Sea Surface Temperature and Salinity
	Settlement Associated with the Thawing of Per- mafrost,	Conditions at Agate Beach, Yaquina Bay and
STRATIGRAPHY	W74-04408 2C	Whale Cove, Oregon, in 1970,
Geochemistry of Permafrost and Quaternary	177-04100	W74-04730 2L
Stratigraphy,	Control of Permafrost Degradation Beneath a	SURF ZONE
W74-04364 2C	Roadway by Subgrade Insulation,	A Field Investigation of Sand Transport in the
Stratigraphy and Diagenesis of Perennially	W74-04409 4C	Surf Zone.
Frozen Sediments in the Barrow, Alaska, Re-	To Pillet of Ventaline Commen	W74-04619 2J
gion,	Long-Term Effects of Vegetative Cover on	
W74-04365 2C	Permafrost Stability in an Area of Discontinu- ous Permafrost,	SURFACE-GROUNDWATER RELATIONSHIPS
CORP AND IMPROVEMENT	W74-04417 4C	Effects of Permafrost on Stream Flow Charac-
STREAM IMPROVEMENT Willamette Cleanup,	W/4-041/	teristics in the Discontinuous Permafrost Zone
W74-04522 5D	Effects of Ground-Ice Variability and Resulting	of Central Alaska, W74-04392 2C
W 74-04322 3D	Thaw Settlements on Buried Warm-Oil	W /4-04392 2C
STREAMFLOW	Pipelines,	Groundwater Pore Pressures Adjacent to Sub-
Hydrology of the Central Arctic River Basins	W74-04422 4C	arctic Streams,
of Alaska,	Performance of a Warm Oil Pineline Puried in	W74-04393 2C
W74-04304 2A	Performance of a Warm-Oil Pipeline Buried in Permafrost,	Package of a Control Alaska I also kee C. barre
A Laboratory Investigation of Essa Surface	W74-04423 8D	Recharge of a Central Alaska Lake by Subper-
A Laboratory Investigation of Free Surface Flows Over Wavy Beds,		mafrost Groundwater, W74-04394 2F
W74-04477 8B	SUBSURFACE FLOW	11 / 1-01374 2F
ов	Studies on the Validity of Darcy's Law for	A Design Procedure for the Conjunctive Use of
Surface-Water Availability, Lauderdale Coun-	Flow in Natural Sands,	Surface and Groundwater Storages,
ty, Alabama,	W74-04307 2F	W74-04598 4B
W74-04494 2E	SUBSURFACE INVESTIGATIONS	Surface- and Ground-Water Conditions During
Characteristics of Streamflow at Gaging Sta-	Groundwater Investigation and Management in	1959-61 in a Part of Flett Creek Basin, Tacoma,
tions in the Loup River Basin, Nebraska,	Iran,	Washington,
W74-04794 2E	W74-04569 7B	W74-04796 2E

SURFACE-GROUNDWATER RELATIONSHIPS

The Operation of a Stream-Aquifer System Under Stochastic Demands,	SWEDEN (SKAGERSHULTAMOSSEN) Bog Vegetation Re-Mapped after Sixty Years:	Spectra of the Temperature and Humidity Fluc- tuations and of the Fluxes of Moisture and Sen-
W74-04808 4B	Studies on Skagershultamossen, Central	sible Heat in the Marine Boundary Layer, W74-04672 2E
SURFACE WATERS Surface-Water Availability, Lauderdale Coun-	Sweden, W74-04683 2I	
ty, Alabama,	SWELL	Comments on Johnson's Paper, 'On the Wind- Driven Circulation of a Stratified Ocean',
W74-04494 2E	Field Measurements of Swell Off the Island of	W74-04675 2E
Principles of Evaluating Effects of Thermal	Aruba, W74-04723 2E	Inshore Sea Surface Temperature and Salinity
Discharges on Surface Waters (Grundlagen fur die Beurteilung der Warmebelastungen von		Conditions at Agate Beach, Yaquina Bay and
Gewassern).	SYNTHETIC HYDROGRAPHS Statistical Analysis of Hydrograph Charac-	Whale Cove, Oregon, in 1970, W74-04730 2L
W74-04764 5C	teristics for Small Urban Watersheds,	Harizontal Distribution of Same Chamical and
SURGES	W74-04459 2A	Horizontal Distribution of Some Chemical and Physical Characteristics in Lipno Reservoir,
Hurricane Storm Surge Considered as a Resonance Phenomenon,	SYSTEMS ANALYSIS	W74-04814 5C
W74-04332 2L	Linear Systems Technique Applied to	TENNESSEE
Feasibility Study for a Surge-Action Model of	Hydrologic Data Analysis and Instrument Evaluation: A Case Study on Data from the	Remote Sensing in Sampling Site Location in
Monterey Harbor, California,	Alice Springs Area,	Lakes and Streams, W74-04313 5A
W74-04721 2L	W74-04470 2A	
SURVEILLANCE PROGRAM Environmental Surveillance for Fuel Fabrica-	Allocation of Funding for Wastewater Treat-	Annual Consumption of Cesium-137 and Cobalt-60 Labeled Pine Seeds by Small Mam-
tion Plants,	ment Facilities, W74-04562 5D	mals in an Oak-Hickory Forest,
W74-04451 5B		W74-04450 5B
SURVEYS	TAIGA (ALASKA) Ecological Effects of River Flooding and	TERRAIN
A Geoecological Terrain Analysis of Discon- tinuously Frozen Ground in the Upper Macken-	Forest Fires on Permafrost in the Taiga of	Influence of Climatic and Terrain Factors on Ground Temperatures at Three Locations in
zie River Valley, Canada,	Alaska,	the Permafrost Region of Canada,
W74-04354 2C	W74-04352 2C	W74-04348 2C
Aerial Radiological Measuring Survey of the	TAPE RECORDERS	TERRAIN ANALYSIS
Area Surrounding the Vermont Yankee Generating Station and the Yankee Nuclear	An Inexpensive S.T.D. Data Logging System, W74-04772 7C	A Geoecological Terrain Analysis of Discon- tinuously Frozen Ground in the Upper Macken-
Power Station, September 18, 1970.		zie River Valley, Canada,
W74-04448 5A	TAXES Sociocultural Impact of Reservoirs on Local	W74-04354 2C
Radiological Status of the Groundwater	Government Institutions, Anthropological	TEXAS
Beneath the Hanford Project, July-December 1972,	Analysis of Social and Cultural Benefits and	Optimal Operation of Multi-Reservoir Water
W74-04452 5B	Costs from Stream Control MeasuresPhase 4, W74-04311 6B	Resources Systems, W74-04314 4A
A Radiological Environmental Survey at EBR-	TEMPERATURE	
II, W74-04455 5B	Thermal Conditions in PermafrostA Review	Quantity and Chemical Quality of Low Flow in the East Fork San Jacinto and West Fork San
	of North American Literature,	Jacinto Rivers near Houston, Texas, June 24,
Water Resources Applications, W74-04584 7B	W74-04347 2C	26, 1969, W74-04481 5B
	Influence of Climatic and Terrain Factors on	
SUSPENDED SOLIDS Method of Treating Sewage Using High	Ground Temperatures at Three Locations in the Permafrost Region of Canada,	Effects of Urbanization on Floods in the Dal- las, Texas, Metropolitan Area,
Polymer Ratio Flocculation Agent Biologically	W74-04348 2C	W74-04483 4C
Produced in Situ, W74-04717 5D	Deep Temperature Observations in the Canadi-	Galveston Bay Hurricane Surge Study: Report
Nucleonic Sediment Concentration Gauge -	an North,	2. Effects of Proposed Barriers on Tides, Cur-
Comparison of Transmission and Scattering	W74-04349 2C	rents, Salinities, and Dye Dispersion for Nor- mal Tide Conditions-Appendix B: Calibration
Modes,	Comments on Veronis' Paper, 'On Properties	tests,
W74-04774 2J	of Seawater Defined by Temperature, Salinity, and Pressure',	W74-04573 8B
SWAMPS	W74-04658 2K	Tenth Year Annual Report, Center for
Observations on the Vegetation of the Koronowo Reservoir,	Temperature Acclimation in the Medusa,	Research in Water Resources, University of Texas at Austin.
W74-04654 2I	Chrysaora quinquecirrha,	W74-04595 9A
SWARDS	W74-04660 5C	Ground-Water Data for Harris County, Texas:
Effect of Long-Term Application of Variously High Rates of Nutrients on Natural Grassland	Thermal Responses in Cirrhina mrigala Fry,	Volume I. Drillers' Logs of Wells, 1905-71.
Swards,	W74-04661 5C	W74-04602 4B
W74-04693 4A	Effects of Temperature on Developing Meristic	Water Quality Records for the Hubbard Creek
SWASH	Structures of Smallmouth Bass, Micropterus	Watershed, Texas, October 1969-September
Sea Waves and Beach Cusps, W74-04734 2J	dolomieui Lacepede, W74-04663 5C	1972, W74-04606 5B
wave Period and the Swash Zone Energy	Temperature Requirements for Embryos and Larvae of the Northern Pike, Esox lucius	TEXTILE DYE WASTES Color Removal from Textile Dye Waste by
Balance,	(Linnaeus),	Coagulation,
W74-04622 2J	W74-04670 5C	W74-04303 5D

Thermal Disturbance Due to Channel Shifting,	Power Plant Cooling Systems, Engineering Aspects,	A Three-Dimensional Model for Estuaries and Coastal Seas: Volume I, Principles of Compu-
Mackenzie Delta, N.W.T., Canada, W74-04351 2C	W74-04555 5G	tation,
Ecological Effects of River Flooding and	Zone of Flow Establishment for Round	W74-04301 2L
Forest Fires on Permafrost in the Taiga of Alaska,	Buoyant Jets, W74-04657 5B	TIDAL CURRENTS Quantitative Tracing of Littoral Drift,
W74-04352 2C	W/4-0103/	W74-04617 2J
Physics, Chemistry, and Mechanics of Frozen	Heat - A Growing Water Pollution Problem, W74-04668 5B	Littoral Drift as Function of Waves and Cur-
Ground: A Review, W74-04373 2C	Principles of Evaluating Effects of Thermal	rent, W74-04623
The Unfrozen Water and the Apparent Specific	Discharges on Surface Waters (Grundlagen fur die Beurteilung der Warmebelastungen von	Hydraulic Model Experiment on the Duffusion Due to the Coastal Current,
Heat Capacity of Frozen Soils, W74-04374 2C	Gewassern). W74-04764 5C	W74-04628 5E
Effect of Porosity on Amount of Soil Water	Problem of Pure Water in the USA, (In Rus-	TIDAL CYCLE
Transferred in a Freezing Silt,	sian),	Shear Velocity in a Tidal Estuary, W74-04629 2L
W74-04376 2C	W74-04837 5G	117707027
Thaw Consolidation of Alaskan Silts and	THERMAL POWERPLANTS	TIDAL EFFECTS Wave Effect on the Coast Formation and Ero
Granular Soils, W74-04379 2C	Reviewing Environmental Impact Statements- Power Plant Cooling Systems, Engineering	sion, W74-04335
Practical Extensions to a Theory of Consolida-	Aspects,	
tion for Thawing Soils,	W74-04555 5G	Estuarine Currents and Tidal Streams, W74-04344 21
W74-04384 2C	Heat - A Growing Water Pollution Problem,	11 111 P' - 1 1 To P' - 1
Sample Disturbance and Thaw Consolidation of	W74-04668 5B	Variable Dispersion and Its Effects on the Movements of Tracers on Beaches,
a Deep Sand Permafrost, W74-04387 2C	THERMAL PREFERENCE	W74-04618 2.
W/4-0436/	The Preferred Temperature of Fish and Their	Shear Velocity in a Tidal Estuary,
Shear Strength at a Thaw Interface,	Midsummer Distribution in Temperate Lakes and Streams.	W74-04629 21
W74-04390 2C	W74-04666 5C	
Settlement Associated with the Thawing of Per-	THERMAL STRATIFICATION	Use of a Computational Model for Two-Dimen sional Tidal Flow.
mafrost,	The Thermal Regime of Lake Lanao	W74-04631 2I
W74-04408 2C	(Philippines) and its Theoretical Implications	Some Characteristics of the Dutch Coast,
Some Effects of Surface Disturbance on the	for Tropical Lakes, W74-04665 2H	W74-04754 2
Permafrost Active Layer at Inuvik, N.W.T.,	W/4-04003 2n	Desetis Beach Changes in a Law Engrey En
Canada, W74-04413 4C	Verification of Water Temperature Forecasts	Drastic Beach Changes in a Low-Energy En vironment Caused by Hurricane Betsy,
	for Deep, Stratified Reservoirs, W74-04807 4A	W74-04756 2
Permafrost Protection for Pipelines, W74-04415 2C	-	Phenomena Affecting Improvement of the
20	THERMAL STRESS	Lower Columbia Estuary and Entrance,
Long-Term Effects of Vegetative Cover on	Thermal Responses in Cirrhina mrigala Fry,	W74-04763 2I
Permafrost Stability in an Area of Discontinu-	W74-04661 5C	TIDAL STREAMS
ous Permafrost, W74-04417 4C	THERMAL WATER	Estuarine Currents and Tidal Streams,
	Ground Water and the Geothermal Resource.	W74-04344 21
Performance of a Warm-Oil Pipeline Buried in Permafrost,	W74-04586 4B	TIDEAL MUD FLATS
W74-04423 8D	THERMOCAPILLARY FLOWS	Changes in the Avifauna of the Biesbosch is
THEORETICAL ANALYSIS	Convective Heat Transfer to Water Containing Bubbles; Enhancement not Dependent on Ther-	the 1st Yr After the Elimination of the Tide, W74-04699
Spectra of the Temperature and Humidity Fluc-	mocapillarity,	
tuations and of the Fluxes of Moisture and Sen-	W74-04664 8B	TIDES
sible Heat in the Marine Boundary Layer,	THERMODYNAMIC BEHAVIOR	The Response to Tidal Fluctuations of a Leak Aquifer System.
W74-04672 2E	Viscosity Measurements of Water in Region of	W74-04308 21
THERMAL DISCHARGES	Its Maximum Density,	Hurricane Tide Prediction for New York Bay,
Heat - A Growing Water Pollution Problem, W74-04668 5B	W74-04518 2K	W74-04343 21
	Analytical Methods of Solution of Conjugated	The Possibility of Forecasting Transien
THERMAL INVERSION	Problems in Convective Heat Transfer, W74-04667 8B	Coastal Relief Changes by Waves,
The Thermal Regime of Lake Lanao (Philippines) and its Theoretical Implications		W74-04436 2
for Tropical Lakes,	THERMOKARST Thermokerst Development Banks Island	Selected Bibliography on Beach Features an
W74-04665 2H	Thermokarst Development, Banks Island, Western Canadian Arctic.	Related Nearshore Processes.
THERMAL POLLUTION	W74-04368 2C	W74-04728 2
Currents at Harbor Beach, Michigan,		An Annotated Bibliography of Flushing an
W74-04342 5B	THERMOPHILIC ANIMALS	Dispersion in Tidal Waters,
Water Quality Requirements of Aquatic In-	Concerning Large-Scale Cultivation of Thermo- philic Cosmopolitan Mastigocladus Laminousus	W74-04731 21
sects,	Cohn (Cyanophyta) in Icelandic Hot Springs,	Waves and Tides Near the Shore,
W74-04551 5C	W74-04486 2I	W74-04758 21

TIME SERIES ANALYSIS

TIME SERIES ANALYSIS		
TIME SERIES ANALYSIS	TRAINING	Modeling of Turbulent Transport in the Surface
Special Analysis of Short Inertial-Internal Wave Records,	Tenth Year Annual Report, Center for Research in Water Resources, University of	Layer, W74-04795 2D
W74-04489 2E	Texas at Austin. W74-04595 9A	TURBULENT BOUNDARY LAYERS
Detailed Time Variations in Mean Temperature		Spectra of the Temperature and Humidity Fluc-
and Heat Content of Some Madison Lakes,	TRANSPARENCY	tuations and of the Fluxes of Moisture and Sen- sible Heat in the Marine Boundary Layer,
W74-04659 2H	Horizontal Distribution of Some Chemical and Physical Characteristics in Lipno Reservoir,	W74-04672 2E
TISZA RIVER	W74-04814 5C	Measurements of the Turbulent Fluxes of Mo-
Water Problems of the Tisza River in Hungary	TRANSPIRATION	mentum, Moisture and Sensible Heat Over the
and Cooperation Among Tisza Basin Countries in the Field of Water Management (Vodnyye	The Effect of Water Spraying on the Rein-	Ocean,
problemy reki Tisy v Vengrii i sotrudnichestvo	Forcement of Physiological Process in Cotton Plants.	W74-04673 2E
stran basseyna Tisy v oblasti vodnogo khoz-	W74-04823 3F	TURKEY
vayst va), W74-04574 4A	TREATMENT FACILITIES	Possible Application of Remote Sensing for Underground Water Exploration in Turkey,
	Mechanical Clarification of Industrial Waste	W74-04568 7B
A Proposal for the Investigation of Possible	Waters (Mechanische Klaerung von Indus-	UNIT HYDROGRAPHS
A Proposal for the Investigation of Possible Ground-Water Contamination in the Bangor	trieabwaessern). W74-04515 5D	Statistical Analysis of Hydrograph Charac-
Area, Kitsap County, Washington,		teristics for Small Urban Watersheds, W74-04459 2A
W74-04491 5B	Modern Waste Water Treatment and Processing Techniques in the Paper and Board	
TOBACCO	Industry (Moderne Abwasseraufbereitungs-und	UNITED KINGDOM (ENGLAND) Sea Waves and Beach Cusps,
Results of Trials with Tobacco and Cotton	Verfahrenstechnik in der Papier- und Kartonin-	W74-04734 2J
Rotations Under Irrigation, (In Bulgarian), W74-04825 3F	dustrie), W74-04517 SD	UNITED STATES
		Environmental Monitoring and Disposal of
TOMATO	A New Secondary Treatment. W74-04524 5D	Radioactive Wastes from U.S. Naval Nuclear-
Potential Intensity of Photosynthesis in Some Tomato and Beet Species Under Different Soil		Powered Ships and Their Support Facilities, 1972,
Moisture, (In Russian),	Study of Pulp and Paper Industry's Effluent Treatment.	W74-04441 5B
W74-04691 3F	W74-04538 5D	What's Wrong with Government Water Control
TOPOGRAPHY	Allocation of Funding for Westernator Trans	Programs and how They can be Improved,
Topology of River Systems and Hydrographic	Allocation of Funding for Wastewater Treat- ment Facilities.	W74-04632 5D
Indicator Studies (Topologiya rechnykh sistem	W74-04562 5D	UNIVERSITIES
i gidrograficheskiye indikatsionnyye iss- ledovaniya),	Hypochlorination of Polluted Storm-Water	Tenth Year Annual Report, Center for Research in Water Resources, University of
W74-04578 2A	Pumpage at New Orleans,	Texas at Austin.
TOXICITY	W74-04676 5D	W74-04595 9A
Effects of Condensates on the Toxicity of	Survey of Facilities Using Land Application of	UNSATURATED FLOW
Kraft Pulp Mill Effluents,	Wastewater, W74-04677 5D	On Solving the Unsaturated Flow Equation: 2.
W74-04521 5D		Critique of Parlange's Method. W74-04492 2G
Apparatus for Recording Avoidance Move-	TRICKLING FILTERS Trickling Filter-Activated Sludge Combinations	
ments of Fish, W74-04776 5A	for Domestic Wastewater Treatment,	Effects of Stratigraphic Layers on Water Flow Through Snow,
	W74-04798 5D	W74-04572 2C
Bioassay Procedures to Evaluate Acute Toxici- ty of Neutralized Bleached Kraft Pulp Mill Ef-	TRITICALE	Water Flow Through Snow Overlying an Im-
fluent to Pacific Salmon,	A Comparative Study of the Size and Recep-	permeable Boundary,
W74-04779 5C	tivity of the Stigma in Wheat, Rye, Triticale and Secalotricum.	W74-04803 2C
TRACE ELEMENTS	W74-04690 3F	URBAN HYDROLOGY
Analysis of Trace Elements, Phosphorus and	TRITIUM	Effects of Urbanization on Floods in the Dal- las, Texas, Metropolitan Area,
Sulphur, in the Lipid and the Non-Lipid Phase	Radiological Status of the Groundwater	W74-04483 4C
of Halibut (Hippoglossus hippoglossus) and Tunny (Thunnus thynnus),	Beneath the Hanford Project, July-December	Summary Report of Metromex Studies, 1971-
W74-04770 5A	1972, W74-04452 5B	1972.
TRACERS		W74-04509 2B
Variable Dispersion and Its Effects on the	TSUNAMIS Hurricane Storm Surge Considered as a	Hydrologic Investigation and Design in Urban
Movements of Tracers on Beaches,	Resonance Phenomenon,	AreasA Review, W74-04597 2A
W74-04618 2J	W74-04332 2L	
Laboratory Applications of Radioisotopic	TUNNY	URBAN RUNOFF Management of Stormwater Runoff in Subur-
Tracers to Follow Beach Sediments, W74-04751 2J	Analysis of Trace Elements, Phosphorus and	ban Environments,
	Sulphur, in the Lipid and the Non-Lipid Phase of Halibut (Hippoglossus hippoglossus) and	W74-04302 5D
A Study of Critical Depth and Mode of Sand	Tunny (Thunnus thynnus),	Effects of Urbanization on Floods in the Dal-
Movement Using Radioactive Glass Sand, W74-04752 2J	W74-04770 5A	las, Texas, Metropolitan Area, W74-04483 4C
_	TURBULENCE	
Tracing Coastal Sediment Movement by Naturally Radioactive Minerals.	Simulation of Horizontal Turbulent Diffusion of Particles Under Waves,	URBAN WATER SUPPLY Community Water Supply.
W74-04753 2J	W74-04624 2J	W74-04510 4B

URBAN WATERSHEDS	USSR (AZOV SEA)	USSR (SUKHAN-DARYA BASIN)
Statistical Analysis of Hydrograph Charac-	Recent Development of the Temryuk Coast on	Morphology and Life Style of the Turkestan
teristics for Small Urban Watersheds, W74-04459 2A	the Azov Sea, W74-04430 2J	Gudgeon Gobio gobio lepidolaemus Kessler in Waters of the Sukhan-Darya Basin, (In Rus-
	***************************************	sian),
URBANIZATION	USSR (CASPIAN SEA)	W74-04650 8I
Multipurpose Reservoirs and Urban Develop-	History of the Formation of the Coasts of	TICOD (TATACETE)
ment, W74-04319 6B	Kara-Bogaz-Gol, W74-04427 2J	USSR (TAIMYR) The Phytoplankton Productivity in the Pyasina
Housing and Diaming Deferences	USSR (CHUSHKA SPIT)	River Near Tareya Village (Western Taimyr),
Housing and Planning References. W74-04511 3D	Developmental History and Present-Day	(In Russian), W74-04698 21
Urbanization: A Hydrological Headache,	Dynamics of the Chushka Spit, W74-04428 2J	USSR (TEREK RIVER DELTA)
W74-04642 4C	W74-04428 2J	Feeding of Juvenile Carp Cyprinus carpio L. in
117701012	USSR (DNESTR RIVER)	the Arakum Bodies of Water (Delta of the
UREDOSPORE INFECTION	Coastal-Water Vegetation of the Lower	Terek River) at Early Developmental Stages,
Relations Between Soil Water Potential and	Reaches of the Dnestr (In Russian),	(In Russian),
Disease in Wheat Seedlings Infected by Puc-	W74-04813 2L	W74-04649 2L
cinia recondita, W74-04653 3F	USSR (GEORGIA)	HOOD GIVER COD
W74-04653 3F	Daily Diet and Rate of Feeding of Notothenia	USSR (UZBEK SSR)
USSR	rossi marmorata Fischer and Dissostichus elegi-	Application of Regression Analysis to Estima- tion of the Efficiency of Water Use in Irriga-
Some Results of Regional Coastal Investiga-	noides Smitt, Family Notothenidae, in the Area	tion (Opyt primeneniya regressionnogo analiza
tions in the USSR,	of Southern Georgia (USSR), (In Russian),	k otsenke effektivnosti ispol'zovaniya vody pri
W74-04426 2J	W74-04679 2I	oroshenii),
-		W74-04580 3F
Water Level Fluctuations of the Caspian Sea	USSR (IRKUTSK REGION)	W /4-04360 3F
(K probleme urovennogo rezhima Kaspiyskogo	Ridge-Pool Complex Formation of Khotkhur-	Hygienic Efficiency of Measures for Protecting
morya),	sky Bog Mass (In Russian),	Surface Waters in Uzbek SSR, (In Russian),
W74-04575 2H	W74-04812 3F	W74-04838 5F
Spring Runoff From Hillslopes, Small	USSR (KAIRAKKUM RESERVOIR)	TIGGE GIVEN CON BOOLED GOVEN
Watersheds, and River Basins (Vesenniy stok	The Feeding of Pelecus Cultratus L. in Kairak-	USSR (UZBEK SSR-BOGAR ZONE)
so sklonov, malykh vodosborov, rechnykh bas-	kum Reservoir, (In Russian),	Water Conditions in Soils of the Bogar Zone of the Uzbek SSR.
seynov),	W74-04695 2H	W74-04809 2G
W74-04577 2E	11.1.0.10.2	W /4-04809 20
	USSR (KAKHOVKA RESERVOIR)	USSR (VOLGA DELTA)
Topology of River Systems and Hydrographic	Micro- and Mesobenthos Development as a	Parasite Fauna of Ctenopharyngodon idella
Indicator Studies (Topologiya rechnykh sistem	Factor of Soil Composition (In Russian),	from Pond- and Spawning-Nursery Fisheries in
i gidrograficheskiye indikatsionnyye iss-	W74-04816 2H	the Volga Delta, (In Russian),
ledovaniya),	TICCH (VALIMINI LAVEC)	W74-04702 8I
W74-04578 2A	USSR (KALININ LAKES)	
Come Manhastad Courses of Water Bullution	Littoral Vegetation Overgrowing in Some	UTAH
Some Neglected Sources of Water Pollution	Lakes of Kalinin District, (In Russina), W74-04646 2H	A Study of Water Institutions in Utah and
(Nedostatochno uchityvayemyye istochniki zagryazneniya prirodnykh vod),	W/4-04040 2H	Their Influence on the Planning, Developing,
W74-04579 5B	USSR (KARKINIT BAY)	and Managing of Water Resources,
117-0-577	Some Data on the Post-Glacial Evolution of	W74-04316 6E
Mudflows (Selevyye potoki),	Karkinit Bay and the Accumulation of Bottom	UTILITIES
W74-04581 4D	Sediments Within it,	Syracuse Metropolitan Area Comprehensive
	W74-04429 2J	Plan-Water and Sewer Plan and Services Allo-
Water Quality Improvement in River Basins		cation Plan,
(Experience of Industrialized Countires) (O	USSR (LAKE BAIKAL)	W74-04507 5D
povyshenii kachestva vody v rechnykh bas-	Ratio of Organic Carbon with Different Types	
seynakh (Opyt industrial'nykh stran)),	of Oxidizability in the Open Water of Baikal (In	Prattville, Alabama Community Development
W74-04583 5G	Russian),	Plan, Vol. II: Summary and Illustrations.
Subglacial Development of Chlorella in Baikal,	W74-04819 5C	W74-04508 5D
(In Russian).	USSR (OSETIAN ASSR-KIROV REGION)	VASCULAR TISSUES
W74-04647 2H	Effect of Fertilizers and Irrigation Conditions	Water in Wood,
117701017	on Yield, Chemical Composition, Baking Quali-	W74-04545 21
USSR (ADZHAR ASSR)	ties of Winter Wheat Grain of Bezostaya I Cul-	W 74-04343
Vertical Distribution of Zoobenthos of the	tivar, (In Russian),	VEGETATION
Mountain River of Adzhar ASSR (In Russian),	W74-04830 3F	Observations on the Vegetation of the
W74-04818 2I		Koronowo Reservoir,
	USSR (SAKHALIN ISLAND)	W74-04654 21
USSR (AMUR FLOODPLAINS)	Morphology and Evolution of aLagoon Coast	
Some New Data Concerning Zizania latifolia	on Sakhalin,	Bog Vegetation Re-Mapped after Sixty Years:
(Grisob.) STAPF AND ITS Resources in the	W74-04433 2J	Studies on Skagershultamossen, Central
Flood Plains of Lower Amur,	USSR (SEVERSKIY-DONETS RIVER)	Sweden,
W74-04703 2I	Phytoplankton Dynamics in the Severskiy	W74-04683 21
USSR (ARAKS RIVER)	Donets River for the First Years After its	Some New Data Concerning Zizania latifolia
Water Regime in Alluvial Fan Soils of the	Regulation, (In Russina),	(Grisob.) STAPF AND ITS Resources in the
Araks River, (In Russian),	W74-04648 5C	Flood Plains of Lower Amur,
W74-04733 2G		W74-04703 21
	USSR (STEPPE LAKES)	
USSR (AZERBAIDZHAN)	Sex Cycle, Spawning and Fertility of West	VEGETATION (COASTAL)
Role of Soil Conditions in the Development of	Siberian Crucians in the Steppe Lakes, (In Rus-	Coastal-Water Vegetation of the Lower
Moths, (In Russian),	sian),	Reaches of the Dnestr (In Russian),
W74-04640 3F	W74-04689 2H	W74-04813 2L

VEGETATION EFFECTS

VEGETATION EFFECTS A Spatial Correlation Between Plant Distribu-	WASHINGTON Nutrient Income Change Related to Plankton	WASTE SOLIDIFICATION Industry Awaits Solutions to Problems of High-
tion and Unfrozen Ground Within a Region of Discontinuous Permafrost,	Algae, W74-04318 5C	Level Radioactive-Waste Management, W74-04457 5D
W74-04355 2C	Ballatain States of the Commitment	WASTE STORAGE
Long-Term Effects of Vegetative Cover on Permafrost Stability in an Area of Discontinu-	Radiological Status of the Groundwater Beneath the Hanford Project, July-December 1972,	Disposal of Radioactive Wastes, W74-04445 5D
ous Permafrost, W74-04417 4C	W74-04452 5B	Industry Awaits Solutions to Problems of High-
VEGETATION OVERGROWTH Littoral Vegetation Overgrowing in Some	Relative Susceptibility of Lakes to Water- Quality Degradation in the Southern Hood	Level Radioactive-Waste Management, W74-04457 5D
Lakes of Kalinin District, (In Russina), W74-04646 2H	Canal Area, Washington, W74-04488 5B	WASTE TREATMENT Disposal of Radioactive Wastes,
UPI D MANACEMENT	Paleohydrology and Sedimentology of Lake	W74-04445 5D
VELD MANAGEMENT Drought and Supplementary Feeding of Sheep in the Karoo.	Missoula Flooding in Eastern Washington, W74-04599 2E	Finland Starts Production of Protein from Black Liquor.
W74-04834 3F	Surface- and Ground-Water Conditions During	W74-04526 5D
VENEZUELA (ANDES AREA)	1959-61 in a Part of Flett Creek Basin, Tacoma,	Pollutant Removal Handbook,
Striated Ground, A Type of Patterned Ground in the Periglacial Area of the Venezuelan	Washington, W74-04796 2E	W74-04527 5D
Andes, (In Spanish),	WASTE BURIAL	Waste Automotive Lubricating Oil as a Mu-
W74-04651 2G	A History and Preliminary Inventory Report on the Kentucky Radioactive Waste Disposal Site,	nicipal Incinerator Fuel, W74-04549 5D
VENEZUELA (ARUBA) Field Measurements of Swell Off the Island of	W74-04442 5B	WASTE WATER DISPOSAL
Aruba,	WASTE DILUTION	Water Supply and Waste Disposal Concepts
W74-04723 2E	Buoyancy Spread of Waste Water in Coastal Regions,	Applicable in Permafrost Regions, W74-04405 5D
VERMONT Aerial Radiological Measuring Survey of the	W74-04630 5B	Mill's Waste Water Used for Spray Irrigation.
Area Surrounding the Vermont Yankee	WASTE DISPOSAL	W74-04543 5D
Generating Station and the Yankee Nuclear Power Station, September 18, 1970.	A History and Preliminary Inventory Report on the Kentucky Radioactive Waste Disposal Site,	Survey of Facilities Using Land Application of
W74-04448 5A	W74-04442 5B	Wastewater, W74-04677 5D
VIRGINIA		
A Study of Diffusion in an Estuary, W74-04333 5B	Ecodistribution of Plutonium in Liquid Waste Disposal Areas at Los Alamos, W74-04443 5B	WASTE WATER TREATMENT Color Removal from Textile Dye Waste by Coagulation,
Hybridization Between the Darters Percina		W74-04303 5D
crassa roanoka and Percina oxyrhyncha (Percidae, Etheostomatini), with Comments on the Distribution of Percina crassa roanoka in	Land Disposal of Waste Gases: 1. Flow Analysis of Gas Injection Systems, W74-04479 5E	Water Supply and Waste Disposal Concepts Applicable in Permafrost Regions,
New River, W74-04472 2E	Land Disposal of Waste Gases: II. Gas Flow	W74-04405 5D
	from Buried Pipes,	A Sewage-Treatment Concept for Permafrost
VIROLOGICAL RESEARCH An Experiment in Sanitary-Virological	W74-04480 5E	Areas, W74-04419 5D
Research on Sewage, (In Russian),	An Analytical Study of a Coiled-Pipe Heat	
W74-04849 5B	Sink, W74-04589 8B	Industry Awaits Solutions to Problems of High- Level Radioactive-Waste Management,
VIRUSES Relative Efficiency of Cell Cultures for Detec-	Hydrologic and Geologic Considerations for	W74-04457 5D
tion of Viruses, W74-04767 5A	Solid-Waste Disposal in West-Central Florida, W74-04605 5E	An Assessment of the Use of Potomac Estuary Waters and AWT Effluents for Emergency
VISCOSITY	WASTE DISPOSAL WELLS	Water Supply, W74-04506 5D
Viscoelastic Properties of Frozen Soil Under	Hydrogeologic Considerations in Solid Waste	
Vibratory Loads, W74-04388 8D	Storage in Iowa: Part 1. Sanitary Landfill Site Selection: Part 2. A Method of Hazardous and	Color of Pulp Industry Waste Liquors. III. The Interaction of Chloro-Oxylignin with Metal
Viscosity Measurements of Water in Region of	Toxic Waste Disposal, W74-04592 5E	Salts (In Japanese), W74-04512 5D
Its Maximum Density, W74-04518 2K	WASTE GAS DISPOSAL	Environmental Chemistry: Air and Water Pollution.
VOLTAMMETRY (ANODIC STRIPPING)	Land Disposal of Waste Gases: 1. Flow Analy-	W74-04513 5B
Determination of the Complexing Capacity of Natural Water,	sis of Gas Injection Systems, W74-04479 5E	Aspects of Colour Removal from Pulp and
W74-04312 2K	Land Disposal of Waste Gases: II. Gas Flow	Paper Mill Effluents, W74-04514 5D
VORTICES Application of the Concept of Rectilinear Vor-	from Buried Pipes, W74-04480 5E	Mechanical Clarification of Industrial Waste
tices to the Movement of Oil Slicks, W74-04490 5B	WASTE QUALITY	Waters (Mechanische Klaerung von Indus- trieabwaessern).
	The Effect of Collecting Time and Grain Size	W74-04515 SD
WALL DISPLACEMENT Waves Generated by Horizontal Motion of a	on the Sampling of Stream Sediments for Geochemical Mapping in the St. Catharines	Modern Waste Water Treatment and
Wall,	Area, Ontario,	Processing Techniques in the Paper and Board
W74-04760 8B	W74-04587 2J	Industry (Moderne Abwasseraufbereitungs-und

WATER DISTRIBUTION (APPLIED)

Verfahrenstechnik in der Papier- und Karton	nin-	Allocation of Funding for Wastewater Treat-	A Syringe Gas-Stripping Procedure for Gas-
dustrie), W74-04517	5D	ment Facilities, W74-04562 5D	Chromatographic Determination of Dissolved Inorganic and Organic Carbon in Fresh Water
			and Carbonates in Sediments,
Willamette Cleanup, W74-04522	5D	Water Quality Improvement in River Basins (Experience of Industrialized Countires) (O	W74-04788 5A
		povyshenii kachestva vody v rechnykh bas-	WATER BALANCE
A New Secondary Treatment. W74-04524	5D	seynakh (Opyt industrial'nykh stran)), W74-04583 5G	The Water Balance in Arctic and Subarctic Re- gionsAnnotated Bibliography and Preliminary
Extensive Effluent Treatment at Hodge	In-	Hypochlorination of Polluted Storm-Water	Assessment,
cludes Color Removal.	***	Pumpage at New Orleans,	W74-04601 2C
W74-04525	5D	W74-04676 5D	Water Conditions in Soils of the Bogar Zone of
Pollutant Removal Handbook,		Survey of Facilities Using Land Application of	the Uzbek SSR, W74-04809 2G
W74-04527	5D	Wastewater,	W74-04809 2G
		W74-04677 5D	WATER CHEMISTRY
Clarification Method of Polluted Water for		Processes for Reducing the Organic-Carbon	Ionic Mobility in Permafrost,
Paper Mills With Combination of Beer Efflu (In Japanese),	ıent	Content of Water Contaminated with Organic	W74-04382 2C
W74-04528	5D	Compounds by Continuous Countercurrent	Evaluation and Simulation of Chemical-Quality
		Multistage Treatment with Activated Carbon,	Data for Five Montana Sampling Stations,
Application of Polyacrylamide to Pulp Mill fluents (In Japanese),	Ef-	W74-04704 5D	W74-04484 2K
W74-04529	5D	Water Purification,	WATER CIRCULATION
	30	W74-04706 5F	Estuaries,
Low Cost Methods for Treating Pulp and Pa	aper	American for Treating Industrial and Demostic	W74-04321 2L
Mill Effluents,	60	Apparatus for Treating Industrial and Domestic Waste Waters,	Currents at Harbor Beach, Michigan,
W74-04531	5D	W74-04707 5D	W74-04342 5B
Hydrogen Peroxide for Industrial Pollu	tion		
Control,		Sedimentation Tanks, W74-04708 5D	A Field Study of Langmuir Circulations,
W74-04532	5D	W/4-04/06	W74-04845 2H
Gravity Dewatering: Application to Paper	Mill	Method and Apparatus for the Biological Treat-	WATER CONSERVATION
Wastes,		ment of Waste Water,	Evaluation of the Use of Pricing as a Tool for
W74-04533	5D	W74-04709 5D	Conserving Water,
Papermill Treatment Plant for Small Industr	rv	Screening Aerator Concentrator,	W74-04810 3D
W74-04534	5D	W74-04712 5D	WATER COOLED REACTORS
		Method and Apparatus for Treating Effluent,	Disposal of Radioactive Wastes,
Boise Cascade Paper Mill and St. Helens S	hare	W74-04714 5D	W74-04445 5D
Treatment Lagoon. W74-04535	5D		WATER DEMAND
W/4-04333	JD	Process for Purifying Water that Contains Or-	Management of Stormwater Runoff in Subur-
Catalytic Oxidation and Thermal Treatmen		ganic Matter, W74-04716 5D	ban Environments,
Waste Waters (Kataliticheskoe okislenie i			W74-04302 5D
micheskoe obezvrezhivanie stochnykh vod) W74-04537	5D	Method of Treating Sewage Using High	Managing Growth in a Fragile Environment:
W/4-04551	30	Polymer Ratio Flocculation Agent Biologically Produced in Situ,	Problems of the Rocky Mountain States,
Study of Pulp and Paper Industry's Effl	uent	W74-04717 5D	W74-04505 6D
Treatment. W74-04538	5D		Syracuse Metropolitan Area Comprehensive
W 74-04336	שנ	Apparatus for Treating Waste Fluids by Means	Plan-Water and Sewer Plan and Services Allo-
1972 Review of the Literature on Pulp	and	of Dissolved Gases, W74-04719 5D	cation Plan,
Paper Effluent Management,		W/1-04/15	W74-04507 5D
W74-04540	5D	Trickling Filter-Activated Sludge Combinations	Prattville, Alabama Community Development
Mercury Removal from Waste Water		for Domestic Wastewater Treatment, W74-04798 5D	Plan, Vol. II: Summary and Illustrations.
Starch Xanthate-Cationic Polymer Complex			W74-04508 5D
W74-04541	5D	Ozonization as a Method of Purifying Water	Economic Aspects of Ground Water Resources
Electrolysis as a Purification Method for	Ef-	Polluted with Chemical Composition, (In Russian),	and Replacement Flows in Semiarid Agricul-
fluents of the Pulp and Paper Industry		W74-04836 5D	tural Areas,
Elektrolyse als Reinigungsverfahren fuer			W74-04563 4B
waesser der Papier- und Zellstoffindustrie), W74-04542		WATER ANALYSIS Determination of Chromium in Sea Water by	The Operation of a Stream-Aquifer System
TT 17-04-54-6	5D	Atomic Absorption Spectrometry,	Under Stochastic Demands,
Solar Energy for the Concentration of Pulp	Mill	W74-04516 5A	W74-04808 4B
Effluents,	-	Analysis of Oracois Pullature is March	Evaluation of the Use of Pricing as a Tool for
W74-04544	5D	Analysis of Organic Pollutants in Water and Waste Water,	Conserving Water,
Physicochemical Processes for Water Qu	ality	W74-04633 5A	W74-04810 3D
Control,			WATER DEPTH
W74-04546	5D	The Direct Enumeration of Escherichia coli in Water Using Macconkey's Agar at 44 C in	A Field Investigation of Sand Transport in the
Lime Disinfection of Sewage Bacteria at	Low	Plastic Pouches,	Surf Zone,
Temperature.		W74-04768 5A	W74-04619 2J
W74-04548	5D		WATER DISTRICTION (APRILED)
200 MGD Activated Sludge Plant Rem	oves	Use of a Silver-Sulfide Electrode for Stan- dardizing Aqueous Sulfide Solution in Deter-	WATER DISTRIBUTION (APPLIED) Mathematical Modeling for Status Prediction
Phosphorus by Pickle Liquor,		mining Sulfide in Water,	and Control of Water Distribution Systems,
W74-04554	5D	W74-04777 5A	W74-04320 4A

WATER DISTRICTS

WATER DISTRICTS Mathematical Modeling for Status Prediction and Control of Water Distribution Systems,	povyshenii kachestva vody v rechnykh bas- seynakh (Opyt industrial'nykh stran)), W74-04583 5G	WATER PROPERTIES Viscosity Measurements of Water in Region of Its Maximum Density,
W74-04320 4A		W74-04518 2K
WATER LAW	Method and Apparatus for Treating Effluent, W74-04714 5D	Biochemical Ecology of Water Pollution,
Southwestern Groundwater Law: A Textual	W/4-04/14	W74-04523 5C
and Bibliographic Interpretation,	Anti-Pollution Barge and Conveyer Assembly,	Comments on Veronis' Paper, 'On Properties
W74-04460 4B	W74-04718 5G	of Seawater Defined by Temperature, Salinity,
WATER LEVEL FLUCTUATIONS	Apparatus for Treating Waste Fluids by Means	and Pressure',
Water Level Fluctuations of the Caspian Sea (K probleme urovennogo rezhima Kaspiyskogo	of Dissolved Gases, W74-04719 5D	W74-04658 2K
morya),	W/4-04/15	WATER PURIFICATION
W74-04575 2H	Problem of Pure Water in the USA, (In Rus-	Water Purification, W74-04706 5F
WATER LEVELS	sian), W74-04837 5G	
Prediction of the 1972 Managua, Nicaragua,		Ozonization as a Method of Purifying Water Polluted with Chemical Composition, (In Rus-
Earthquake from Groundwater Changes, In- ferred Probability of Earthquakes in the City of Managua, Nicaragua, during the Summer of	WATER POLLUTION EFFECTS Estimating the Benefits of Stream Valley and Open Space Preservation Projects,	sian), W74-04836 5D
1973,	W74-04500 6B	WATER QUALITY
W74-04467 2F	Biochemical Ecology of Water Pollution,	Baseline Quality Data for Kalihi Stream,
Water Level Fluctuations of the Caspian Sea (K probleme urovennogo rezhima Kaspiyskogo	W74-04523 5C	W74-04309 5B
morya),	Principles of Evaluating Effects of Thermal	A Detailed Investigation of the Sociological, Economic, and Ecological Aspects of Proposed
W74-04575 2H	Discharges on Surface Waters (Grundlagen fur die Beurteilung der Warmebelastungen von	Reservoir Sites in the Salt River Basin of Ken-
WATER MANAGEMENT (APPLIED)	Gewassern).	tucky,
Water Problems of the Tisza River in Hungary	W74-04764 5C	W74-04310 2A
and Cooperation Among Tisza Basin Countries in the Field of Water Management (Vodnyye	WATER POLLUTION SOURCES	Evaluation of the Ground-Water Supply at
problemy reki Tisy v Vengrii i sotrudnichestvo	Environmental Radioactivity,	Eight Sites in Glacier National Park, Northwestern Montana,
stran basseyna Tisy v oblasti vodnogo khoz- vayst va),	W74-04456 5B	W74-04469 2F
W74-04574 4A	Phosphorus Relationships in Runoff from Fer- tilized Soils.	Quantity and Chemical Quality of Low Flow in
WATER POLICY	W74-04471 5B	the East Fork San Jacinto and West Fork San
A Study of Water Institutions in Utah and	Bolatina Susaantihilitu of John to Water	Jacinto Rivers near Houston, Texas, June 24, 26, 1969,
Their Influence on the Planning, Developing,	Relative Susceptibility of Lakes to Water- Quality Degradation in the Southern Hood	W74-04481 5B
and Managing of Water Resources, W74-04316 6E	Canal Area, Washington, W74-04488 5B	Evaluation and Simulation of Chemical-Quality
State Standards for Temperature, (Issued by	A Proposal for the Investigation of Possible	Data for Five Montana Sampling Stations, W74-04484 2K
the Environmental Protection Agency in August 1972).	Ground-Water Contamination in the Bangor	Reconnaissance of the Ground-Water
W74-04669 5G	Area, Kitsap County, Washington, W74-04491 5B	Resources of Cimarron County, Oklahoma,
WATER POLLUTION	W/4-04491 3B	W74-04495 4B
Environmental Quality, The Fourth Annual Re-	Characteristics of Pulp and Paper Mill Wastes	Lakes in the Boulder-Fort Collins-Greeley
port of the Council on Environmental Quality.	and ISI Standards, W74-04530 5B	Area, Front Range Urban Corridor, Colorado,
W74-04504 5G		W74-04496 2H
Environmental Chemistry: Air and Water Pol- lution,	Water Pollution in the Netherlands, W74-04536 5B	Estimating the Benefits of Stream Valley and Open Space Preservation Projects,
W74-04513 5B	Some Neglected Sources of Water Pollution	W74-04500 6B
The Effect of Collecting Time and Grain Size	(Nedostatochno uchityvayemyye istochniki	Application of Dynamic Programming in Mar-
on the Sampling of Stream Sediments for Geochemical Mapping in the St. Catharines	zagryazneniya prirodnykh vod), W74-04579 5B	kov Chains to the Evaluation of Water Quality in Irrigation,
Area, Ontario, W74-04587 2J	Analysis of Organic Pollutants in Water and	W74-04561 3C
	Waste Water,	Chemical Quality of Streams, Allegheny River
WATER POLLUTION CONTROL	W74-04633 5A	Basin and Part of the Lake Erie Basin, New York,
Approaches to Stormwater Management, W74-04458 5A	Soluble Phosphate Output of an Agricultural	W74-04593 2K
State of Art Basiess Water Balletian Control	Watershed in Pennsylvania, W74-04804 5B	Availability of Ground Water in the Winnsboro
State-of-Art Review: Water Pollution Control Benefits and Costs, Vol I,	Problem of Pure Water in the USA, (In Rus-	Area, Louisiana,
W74-04464 5G	sian),	W74-04596 4B
Research Needs and Priorities: Water Pollution	W74-04837 5G	Effects of Backpumping from South New
Control Benefits and Costs, Vol. II, W74-04465 5G	WATER POLLUTION TREATMENT	River Canal at Pump Station S-9 on Quality of Water in Water-Conservation Area 3, Broward
	Low Cost Methods for Treating Pulp and Paper	County, Florida,
Allocation of Funding for Wastewater Treat- ment Facilities,	Mill Effluents, W74-04531 5D	W74-04600 5B
W74-04562 5D		Water Quality Records for the Hubbard Creek
Water Quality Improvement in River Basins	Hypochlorination of Polluted Storm-Water Pumpage at New Orleans,	Watershed, Texas, October 1969-September 1972,
(Experience of Industrialized Counties) (O	W74.04676 SD	1972, W74-04606 SB

Urbanization: A Hydrological Headache,	WATER REQUIREMENTS	Evaluation of the Ground-Water Supply at
W74-04642 4C	Plant Responses to Water Stress, W74-04539 21	Eight Sites in Glacier National Park, Northwestern Montana,
The Application of Numerical Simulation Models in the Assessment of the Effect of	WATER RECOVERED	W74-04469 2F
Discharges into Coastal Waters,	WATER RESOURCES Cento Seminar on the Application of Remote	Land Value Increments as a Measure of the
W74-04674 5B	Sensors in the Determination of natural Resources.	Net Benefits of Urban Water Supply Projects in Developing Countries: Theory and Measure-
Hygienic Efficiency of Measures for Protecting Surface Waters in Uzbek SSR, (In Russian),	W74-04567 7B	ment, W74-04502 6B
W74-04838 5F	Operational and Experimental Remote Sensing	W/4-04302
WATER QUALITY CONTROL	in Hydrology,	Managing Growth in a Fragile Environment:
1972 Review of the Literature on Pulp and	W74-04570 7B	Problems of the Rocky Mountain States, W74-04505 6D
Paper Effluent Management,	WATER RESOURCES DEVELOPMENT	11777303
W74-04540 5D	Capitalization of the Benefits of Water	Syracuse Metropolitan Area Comprehensive Plan-Water and Sewer Plan and Services Allo-
Physicochemical Processes for Water Quality	Resource Development, W74-04501 6B	cation Plan,
Control, W74-04546 5D		W74-04507 5D
	Physicochemical Processes for Water Quality Control.	Prattville, Alabama Community Development
Benefit of Water Pollution Control on Property Values.	W74-04546 5D	Plan, Vol. II: Summary and Illustrations.
W74-04550 5G		W74-04508 5D
	WATER RESOURCES RESEARCH ACT	Community Water Supply.
Water Quality Improvement in River Basins	Tenth Year Annual Report, Center for Research in Water Resources, University of	W74-04510 4B
(Experience of Industrialized Countires) (O povyshenii kachestva vody v rechnykh bas-	Texas at Austin.	Harrison and Discovery Defenses
seynakh (Opyt industrial'nykh stran)),	W74-04595 9A	Housing and Planning References. W74-04511 3D
W74-04583 5G	Federal Water Resources Research Program	
What's Wrong with Government Water Control	for 1971.	WATER SUPPLY DEVELOPMENT
Programs and how They can be Improved,	W74-04848 9D	Land Value Increments as a Measure of the Net Benefits of Urban Water Supply Projects
W74-04632 5D	WATER REUSE	in Developing Countries: Theory and Measure-
Skimmer Trap,	Management of Stormwater Runoff in Subur-	ment,
W74-04713 5G	ban Environments,	W74-04502 6B
	W74-04302 5D	WATER TEMPERATURE
Method and Apparatus for Treating Effluent, W74-04714 5D	Social, Economic, Environmental, and Techni-	Detailed Time Variations in Mean Temperature
W/4-04/14	cal Factors Influencing Water Reuse,	and Heat Content of Some Madison Lakes,
Apparatus for Treating Waste Fluids by Means	W74-04317 5D	W74-04659 2H
of Dissolved Gases, W74-04719 5D	An Assessment of the Use of Potomac Estuary	Convective Heat Transfer to Water Containing
	Waters and AWT Effluents for Emergency	Bubbles: Enhancement not Dependent on Ther-
WATER QUALITY REQUIREMENTS Water Quality Requirements of Aquatic In-	Water Supply,	mocapillarity, W74-04664 8B
sects.	W74-04506 5D	
W74-04551 5C	Water Reuse and Deposits Control,	The Thermal Regime of Lake Lanao
WATER QUALITY STANDARDS	W74-04520 5D	(Philippines) and its Theoretical Implications for Tropical Lakes,
Baseline Quality Data for Kalihi Stream,	Effects of Condensates on the Toxicity of	W74-04665 2H
W74-04309 5B	Kraft Pulp Mill Effluents,	m p (- 1 T (T') - 1 T' '-
An Assessment of the Use of Potomac Estuary	W74-04521 5D	The Preferred Temperature of Fish and Their Midsummer Distribution in Temperate Lakes
Waters and AWT Effluents for Emergency	Marine Was Marine Marine Communication	and Streams,
Water Supply,	Mill's Waste Water Used for Spray Irrigation. W74-04543 5D	W74-04666 5C
W74-04506 5D		State Standards for Temperature, (Issued by
Modern Waste Water Treatment and	Survey of Facilities Using Land Application of	the Environmental Protection Agency in Au-
Processing Techniques in the Paper and Board	Wastewater, W74-04677 5D	gust 1972).
Industry (Moderne Abwasseraufbereitungs-und	-	W74-04669 5G
Verfahrenstechnik in der Papier- und Kartonin- dustrie),	WATER RIGHTS	Verification of Water Temperature Forecasts
W74-04517 5D	Southwestern Groundwater Law: A Textual and Bibliographic Interpretation,	for Deep, Stratified Reservoirs,
Characteristics of Pulp and Paper Mill Wastes	W74-04460 4B	W74-04807 4A
and ISI Standards.		WATER TREATMENT
W74-04530 5B	WATER SPREADING Survey of Facilities Using Land Application of	Water Quality Improvement in River Basins
What's Wrong with Government Water Control	Wastewater,	(Experience of Industrialized Countires) (O povyshenii kachestva vody v rechnykh bas-
Programs and how They can be Improved,	W74-04677 5D	seynakh (Opyt industrial'nykh stran)),
W74-04632 5D	WATER STORAGE	W74-04583 5G
State Standards for Temperature, (Issued by	A Design Procedure for the Conjunctive Use of	Water Purification
the Environmental Protection Agency in Au-	Surface and Groundwater Storages,	Water Purification, W74-04706 5F
gust 1972).	W74-04598 4B	
W74-04669 5G	WATER SUPPLY	Water Cleaning Treatment,
WATER QUANTITY	Water Supply and Waste Disposal Concepts	W74-04710 3A
Urbanization: A Hydrological Headache,	Applicable in Permafrost Regions,	Skimmer Trap,
W74-04642 4C	W74-04405 5D	W74-04713 5G

WATER UTILIZATION

WATER UTILIZATION Application of Regression Analysis to Estima-	WAVE PROPAGATION Use of a Computational Model for Two-Dimen-	Theoretical Forms of Shorelines, W74-04336 2J
tion of the Efficiency of Water Use in Irriga-	sional Tidal Flow,	Wayne in Charling Water
tion (Opyt primeneniya regressionnogo analiza k otsenke effektivnosti ispol'zovaniya vody pri	W74-04631 2L	Waves in Shoaling Water, W74-04338 8B
oroshenii).	WAVE REFLECTION	
W74-04580 3F	Wave Reflection and Transmission in Channels	A Refraction Study and Program for Periodic
	of Variable Section,	Waves Approaching a Shoreline, and Extend- ing Beyond the Breaking Point,
Evaluation of the Use of Pricing as a Tool for Conserving Water,	W74-04614 8B	W74-04340 8B
W74-04810 3D	WAVE RUN-UP	
	SURF,	Hurricane Tide Prediction for New York Bay, W74-04343 2L
Water Consumption and Biological Coefficient	W74-04725 2J	W /4-04343 2L
of Furrow and Sprinkler Irrigated Cotton, (In Bulgarian),	An Approximation of the Wave Run-Up	Dynamics and Morphology of Sea Coasts.
W74-04824 3F	Frequency Distribution,	W74-04425 2J
	W74-04740 2L	Some Results of Regional Coastal Investiga-
WATER WELLS		tions in the USSR.
Risk of Uncontrolled Flow from Wells Through Permafrost,	Transformation, Breaking and Run-Up of a	W74-04426 2J
W74-04395 2F	Long Wave of Finite Height, W74-04741 2L	Submarine Sand Ridges as Indicators of
	W/4-04/41	Longshore Migration of Sediments,
Ground-Water Data for Harris County, Texas:	On Non-Saturated Breakers and the Wave Run-	W74-04434 2J
Volume I. Drillers' Logs of Wells, 1905-71. W74-04602 4B	Up,	
117-01002	W74-04742 2L	Certain Aspects of the Interaction Between
WATER WITHDRAWAL (PLANTS)	WAVE SPECTRA	Wave Flow and a Deformable Bottom at Low Velocities.
Water Withdrawal by Plant Roots,	Modification of Wave Spectra on the Continen-	W74-04435 2J
W74-04655 3F	tal Shelf and in the Surf Zone,	
WATERFOWL	W74-04762 2L	The Possibility of Forecasting Transient
A Find of Marsh Sandpiper Tringa stagnatilis in	WAVE STEEPNESS	Coastal Relief Changes by Waves, W74-04436 2J
the Netherlands,	Wave Reflection and Transmission in Channels	W /4-04436 23
W74-04681 5C	of Variable Section,	The Determination of Maximum Wave Veloci-
WATERSHED MANAGEMENT	W74-04614 8B	ties in the Shore Zone of the Sea,
Water Problems of the Tisza River in Hungary	The Effect of Waves on the Profile of a Natu-	W74-04437 2J
and Cooperation Among Tisza Basin Countries	ral Beach,	The Effect of Wave Refraction on the Forma-
in the Field of Water Management (Vodnyye	W74-04620 2J	tion of an Equilibrium Profile of Submarine
problemy reki Tisy v Vengrii i sotrudnichestvo stran basseyna Tisy v oblasti vodnogo khoz-		Coastal Slope,
vayst va),	Laboratory Study of Scale Effects in Two-	W74-04438 2J
W74-04574 4A	Dimensional Beach Processes, W74-04748 2L	The Possibility of Predicting Longshore Cur-
MATERIAL (BACENC)	W/4-04/46 ZL	rents in Tideless Seas,
WATERSHEDS (BASINS) Water Problems of the Tisza River in Hungary	WAVE VELOCITY	W74-04439 2J
and Cooperation Among Tisza Basin Countries	The Determination of Maximum Wave Veloci-	The Elevation, Slope, and Curvature Spectra of
in the Field of Water Management (Vodnyye	ties in the Shore Zone of the Sea,	a Wind Roughened Sea Surface,
problemy reki Tisy v Vengrii i sotrudnichestvo	W74-04437 2J	W74-04476 2E
stran basseyna Tisy v oblasti vodnogo khoz-	WAVES INTERFERENCE (WATER)	
vayst va), W74-04574 4A	Wave Interaction and Langmuir Circulations,	Special Analysis of Short Inertial-Internal Wave Records,
W 14-04514	W74-04844 2H	W74-04489 2E
WAVE ACTION	WAVES (WATER)	11777102
Floating Breakwater Pontoon,	Harmonic Generation of Shallow Water Waves	Waves at Camp Pendleton, California,
W74-04711 8B	Over Topography,	W74-04607 2E
WAVE ENERGY	W74-04323 2E	Waves Off Benghazi Harbour - Libya,
Mean Direction of Waves and of Wave Energy,	Country of Laurehan Country Description of	W74-04608 2I
W74-04328 2J	Growth of Longshore Currents Downstream of a Surf-Zone Barrier,	Ch. H. W. L. W A Commission of The
The Possibility of Predicting Longshore Cur-	W74-04324 2J	Shallow Water Waves: A Comparison of Theo ries and Experiments,
rents in Tideless Seas,	***************************************	W74-04609 2E
W74-04439 2J	The Solitary Wave,	
WAVE GENERATION	W74-04326 8B	Breaking Wave Criteria; A Study Employing
Physical and Dynamical Scales for Generation	Mixing Processes,	Numerical Wave Theory, W74-04610 2F
of Wind Waves.	W74-04327 5B	W /4-04010 21
W74-04330 2E		Hyperbolic Waves and Their Shoaling,
WAVE REIGHT	The Relationship Between Wave Action and Beach Profile Characteristics.	W74-04611 2E
WAVE HEIGHT Breaking Wave Criteria; A Study Employing a	W74-04331 2J	Effect of Beach Slope and Shoaling on Wave
Numerical Wave Theory,		Asymmetry,
W74-04610 2E	Hurricane Storm Surge Considered as a	W74-04612 2E
Laboratory Study of Sails Different to ma	Resonance Phenomenon,	The Effects of Bottom Configuration on the
Laboratory Study of Scale Effects in Two- Dimensional Beach Processes,	W74-04332 2L	Deformation, Breaking and Run-Up of Solitary
W74-04748 2L	Littoral Transport in the Great Lakes,	Waves,
	W74-04334 2J	W74-04613 21
WAVE PERIOD	Wave Effect on the Coast Formation and Ero-	Wave Reflection and Transmission in Channel
Wave Period and the Swash Zone Energy Balance,	sion,	of Variable Section,
W74-04622 2J	W74-04335 2J	W74-04614 81

	Laboratory Study of Scale Effects in Two-	WHEAT MONOCULTURE
Layers in Standing Waves,	Dimensional Beach Processes,	Comparative Testing of Short-Term Wheat
W74-04615 2J	W74-04748 2L	Monoculture, (In Bulgarian),
A Field Investigation of Sand Transport in the	Longshore Currents in One and Multi-Bar	W74-04831 3F
Surf Zone,	Profiles Relation to Littoral Drift,	WHEAT SEEDLINGS
W74-04619 2J	W74-04749 2L	Relations Between Soil Water Potential and
mt mee a fill and the Building No.		Disease in Wheat Seedlings Infected by Puc-
The Effect of Waves on the Profile of a Natural Beach.	Rhythmic Pattern of Longshore Bars Related to	cinia recondita,
W74-04620 2J	Sediment Characteristics, W74-04750 2J	W74-04653 3F
17701020	W14-04/30	WHEAT VARIETIES
Wave Period and the Swash Zone Energy	Laboratory Applications of Radioisotopic	Productivity and Grain Qualities of Certain
Balance,	Tracers to Follow Beach Sediments,	Newly Developed Native and Foreign Wheat
W74-04622 2J	W74-04751 2J	Varieties Grown Under Irrigation, (In Bulgari-
Littoral Drift as Function of Waves and Cur-	A Study of Critical Depth and Mode of Sand	an),
rent,	Movement Using Radioactive Glass Sand,	W74-04832 3F
W74-04623 2J	W74-04752 2J	WHEAT (WINTER)
Floating Prankwater Bostoon		Nutrient Uptake by Winter Wheat in a Zone of
Floating Breakwater Pontoon, W74-04711 8B	Tracing Coastal Sediment Movement by Natu-	Unstable Moisture, (In Russian),
W/+04/11 6B	rally Radioactive Minerals,	W74-04827 3F
Feasibility Study for a Surge-Action Model of	W74-04753 2J	
Monterey Harbor, California,	Some Characteristics of the Dutch Coast,	Effect of Fertilizers and Irrigation Conditions
W74-04721 2L	W74-04754 2J	on Yield, Chemical Composition, Baking Quali
Shore Transport. Formation of Sand Spits and		ties of Winter Wheat Grain of Bezostaya 1 Cul
Tombolos,	Similarity in Sediment Transport Due to	tivar, (In Russian), W74-04830 3F
W74-04722 2J	Waves,	W /4-04830
	W74-04755 2J	WILLAMETTE RIVER (OREGON)
Field Measurements of Swell Off the Island of	Waves and Tides Near the Shore,	Environmental Quality, The Fourth Annual Re
Aruba,	W74-04758 2L	port of the Council on Environmental Quality.
W74-04723 2E		W74-04504 50
SURF,	Numerical Computations of Storm Surges with	William Channel
W74-04725 2J	Bottom Stress,	Willamette Cleanup, W74-04522 5I
	W74-04759 2L	W 74-04322
Selected Bibliography on Beach Features and	Waves Generated by Horizontal Motion of a	WIND
Related Nearshore Processes.	Wall.	Comments on Johnson's Paper, 'On the Wind
W74-04728 2J	W74-04760 8B	Driven Circulation of a Stratified Ocean',
Wave Forecasting Relationships for the Gulf of		W74-04675 2E
Mexico,	Approximate Estimations of Correlation Coef-	WIND EDOCION
W74-04729 2E	ficient Between Wave Height and Period of	WIND EROSION The Role of Eolian Processes in the Dynamic
Research in the Coastal and Oceanic Environ-	Shallow Water Wind Waves, W74-04761 2L	of a Shallow Accumulation Coast,
ment. A Summary of Research Accomplished	W/4-04/61 2L	W74-04440 2
Under Project Themis,	Propagation of a Finite-Amplitude Surface	
W74-04732 2L	Wave With Allowance for Random Irregulari-	Eolian Cross-Bedding in the Beach Dune En
	ties of the Bottom,	vironment, Sapelo Island, Georgia,
Sea Waves and Beach Cusps,	W74-04841 2J	W74-04737 2
W74-04734 2J	Wave Interaction and Langmuir Circulations,	WIND TIDES
Rhomboid Ripple Mark, Indicator of Current	W74-04844 2H	Modification of Nearshore Currents by Coasta
Direction and Environment,	W/4-04044	Structures,
W74-04739 2J	A Field Study of Langmuir Circulations,	W74-04341 81
	W74-04845 2H	
		Currents at Harbor Beach, Michigan,
An Approximation of the Wave Run-Up	WEATHER MODIFICATION	
Frequency Distribution,	WEATHER MODIFICATION Supports Person of Meteores Studies 1971	W74-04342 51
	Summary Report of Metromex Studies, 1971-	W74-04342 51
Frequency Distribution,	Summary Report of Metromex Studies, 1971-1972.	W74-04342 51 WIND TRANSPORT
Frequency Distribution, W74-04740 2L	Summary Report of Metromex Studies, 1971-	W74-04342 51 WIND TRANSPORT The Role of Eolian Processes in the Dynamic
Frequency Distribution, W74-04740 2L Transformation, Breaking and Run-Up of a	Summary Report of Metromex Studies, 1971-1972.	W74-04342 51 WIND TRANSPORT
Frequency Distribution, W74-04740 2L Transformation, Breaking and Run-Up of a Long Wave of Finite Height, W74-04741 2L	Summary Report of Metromex Studies, 1971- 1972. W74-04509 2B	W74-04342 51 WIND TRANSPORT The Role of Eolian Processes in the Dynamic of a Shallow Accumulation Coast, W74-04440 2
Frequency Distribution, W74-04740 2L Transformation, Breaking and Run-Up of a Long Wave of Finite Height, W74-04741 2L On Non-Saturated Breakers and the Wave Run-	Summary Report of Metromex Studies, 1971- 1972. W74-04509 2B Electric Cloud and Weather Modification with	W74-04342 51 WIND TRANSPORT The Role of Eolian Processes in the Dynamic of a Shallow Accumulation Coast, W74-04440 2 WIND VELOCITY
Frequency Distribution, W74-04740 2L Transformation, Breaking and Run-Up of a Long Wave of Finite Height, W74-04741 2L On Non-Saturated Breakers and the Wave Run-Up,	Summary Report of Metromex Studies, 1971- 1972. W74-04509 2B Electric Cloud and Weather Modification with Intense Relativistic Electron Beams, W74-04604 3B	W74-04342 51 WIND TRANSPORT The Role of Eolian Processes in the Dynamic of a Shallow Accumulation Coast, W74-04440 2 WIND VELOCITY Physical and Dynamical Scales for Generatio
Frequency Distribution, W74-04740 2L Transformation, Breaking and Run-Up of a Long Wave of Finite Height, W74-04741 2L On Non-Saturated Breakers and the Wave Run-	Summary Report of Metromex Studies, 1971-1972. W74-04509 2B Electric Cloud and Weather Modification with Intense Relativistic Electron Beams, W74-04604 3B WELL ENTRANCE LOSSES	W74-04342 51 WIND TRANSPORT The Role of Eolian Processes in the Dynamic of a Shallow Accumulation Coast, W74-04440 2 WIND VELOCITY Physical and Dynamical Scales for Generatio of Wind Waves,
Frequency Distribution, W74-04740 2L Transformation, Breaking and Run-Up of a Long Wave of Finite Height, W74-04741 2L On Non-Saturated Breakers and the Wave Run-Up, W74-04742 2L Effect of Entrance on Seiche Motion in Ocean	Summary Report of Metromex Studies, 1971- 1972. W74-04509 2B Electric Cloud and Weather Modification with Intense Relativistic Electron Beams, W74-04604 3B WELL ENTRANCE LOSSES Studies on the Validity of Darcy's Law for	W74-04342 51 WIND TRANSPORT The Role of Eolian Processes in the Dynamic of a Shallow Accumulation Coast, W74-04440 2 WIND VELOCITY Physical and Dynamical Scales for Generatio
Frequency Distribution, W74-04740 2L Transformation, Breaking and Run-Up of a Long Wave of Finite Height, W74-04741 2L On Non-Saturated Breakers and the Wave Run-Up, W74-04742 2L Effect of Entrance on Seiche Motion in Ocean Ports,	Summary Report of Metromex Studies, 1971-1972. W74-04509 2B Electric Cloud and Weather Modification with Intense Relativistic Electron Beams, W74-04604 3B WELL ENTRANCE LOSSES	W74-04342 51 WIND TRANSPORT The Role of Eolian Processes in the Dynamic of a Shallow Accumulation Coast, W74-04440 2 WIND VELOCITY Physical and Dynamical Scales for Generatio of Wind Waves,
Frequency Distribution, W74-04740 2L Transformation, Breaking and Run-Up of a Long Wave of Finite Height, W74-04741 2L On Non-Saturated Breakers and the Wave Run-Up, W74-04742 2L Effect of Entrance on Seiche Motion in Ocean	Summary Report of Metromex Studies, 1971-1972. W74-04509 2B Electric Cloud and Weather Modification with Intense Relativistic Electron Beams, W74-04604 3B WELL ENTRANCE LOSSES Studies on the Validity of Darcy's Law for Flow in Natural Sands, W74-04307 2F	W74-04342 51 WIND TRANSPORT The Role of Eolian Processes in the Dynamic of a Shallow Accumulation Coast, W74-04440 2 WIND VELOCITY Physical and Dynamical Scales for Generatio of Wind Waves, W74-04330 22
Frequency Distribution, W74-04740 2L Transformation, Breaking and Run-Up of a Long Wave of Finite Height, W74-04741 2L On Non-Saturated Breakers and the Wave Run-Up, W74-04742 2L Effect of Entrance on Seiche Motion in Ocean Ports,	Summary Report of Metromex Studies, 1971-1972. W74-04509 2B Electric Cloud and Weather Modification with Intense Relativistic Electron Beams, W74-04604 3B WELL ENTRANCE LOSSES Studies on the Validity of Darcy's Law for Flow in Natural Sands, W74-04307 2F WETLANDS	W74-04342 51 WIND TRANSPORT The Role of Eolian Processes in the Dynamic of a Shallow Accumulation Coast, W74-04440 2 WIND VELOCITY Physical and Dynamical Scales for Generatio of Wind Waves, W74-04330 21 WIND WAVES Physical and Dynamical Scales for Generatio of Wind Waves, w74-04330 21
Frequency Distribution, W74-04740 2L Transformation, Breaking and Run-Up of a Long Wave of Finite Height, W74-04741 2L On Non-Saturated Breakers and the Wave Run-Up, W74-04742 2L Effect of Entrance on Seiche Motion in Ocean Ports, W74-04743 2L	Summary Report of Metromex Studies, 1971-1972. W74-04509 Electric Cloud and Weather Modification with Intense Relativistic Electron Beams, W74-04604 3B WELL ENTRANCE LOSSES Studies on the Validity of Darcy's Law for Flow in Natural Sands, W74-04307 WETLANDS Institutional Framework Affecting the Use of	W74-04342 51 WIND TRANSPORT The Role of Eolian Processes in the Dynamic of a Shallow Accumulation Coast, W74-04440 2 WIND VELOCITY Physical and Dynamical Scales for Generatio of Wind Waves, W74-04330 2 WIND WAVES Physical and Dynamical Scales for Generatio
Frequency Distribution, W74-04740 2L Transformation, Breaking and Run-Up of a Long Wave of Finite Height, W74-04741 2L On Non-Saturated Breakers and the Wave Run-Up, W74-04742 2L Effect of Entrance on Seiche Motion in Ocean Ports, W74-04743 2L Investigation of Seiche Activity in West Coast	Summary Report of Metromex Studies, 1971-1972. W74-04509 2B Electric Cloud and Weather Modification with Intense Relativistic Electron Beams, W74-04604 3B WELL ENTRANCE LOSSES Studies on the Validity of Darcy's Law for Flow in Natural Sands, W74-04307 2F WETLANDS Institutional Framework Affecting the Use of Inland Wetlands in Massachusetts,	W74-04342 51 WIND TRANSPORT The Role of Eolian Processes in the Dynamic of a Shallow Accumulation Coast, W74-04440 2 WIND VELOCITY Physical and Dynamical Scales for Generatio of Wind Waves, W74-04330 2 WIND WAVES Physical and Dynamical Scales for Generatio of Wind Waves, W74-04330 22
Frequency Distribution, W74-04740 2L Transformation, Breaking and Run-Up of a Long Wave of Finite Height, W74-04741 2L On Non-Saturated Breakers and the Wave Run-Up, W74-04742 2L Effect of Entrance on Seiche Motion in Ocean Ports, W74-04743 2L Investigation of Seiche Activity in West Coast Harbors, W74-04744 2L	Summary Report of Metromex Studies, 1971-1972. W74-04509 Electric Cloud and Weather Modification with Intense Relativistic Electron Beams, W74-04604 3B WELL ENTRANCE LOSSES Studies on the Validity of Darcy's Law for Flow in Natural Sands, W74-04307 WETLANDS Institutional Framework Affecting the Use of	W74-04342 51 WIND TRANSPORT The Role of Eolian Processes in the Dynamic of a Shallow Accumulation Coast, W74-04440 2 WIND VELOCITY Physical and Dynamical Scales for Generatio of Wind Waves, W74-04330 2 WIND WAVES Physical and Dynamical Scales for Generatio of Wind Waves, W74-04330 2 Wave Effect on the Coast Formation and Erce
Frequency Distribution, W74-04740 2L Transformation, Breaking and Run-Up of a Long Wave of Finite Height, W74-04741 2L On Non-Saturated Breakers and the Wave Run-Up, W74-04742 2L Effect of Entrance on Seiche Motion in Ocean Ports, W74-04743 2L Investigation of Seiche Activity in West Coast Harbors, W74-04744 2L Flume Experiments on Sand Transport by	Summary Report of Metromex Studies, 1971-1972. W74-04509 2B Electric Cloud and Weather Modification with Intense Relativistic Electron Beams, W74-04604 3B WELL ENTRANCE LOSSES Studies on the Validity of Darcy's Law for Flow in Natural Sands, W74-04307 2F WETLANDS Institutional Framework Affecting the Use of Inland Wetlands in Massachusetts, W74-04462 4A	W74-04342 51 WIND TRANSPORT The Role of Eolian Processes in the Dynamic of a Shallow Accumulation Coast, W74-04440 2 WIND VELOCITY Physical and Dynamical Scales for Generatio of Wind Waves, W74-04330 21 WIND WAVES Physical and Dynamical Scales for Generatio of Wind Waves, W74-04330 22 Wave Effect on the Coast Formation and Ercsion,
Frequency Distribution, W74-04740 2L Transformation, Breaking and Run-Up of a Long Wave of Finite Height, W74-04741 2L On Non-Saturated Breakers and the Wave Run-Up, W74-04742 2L Effect of Entrance on Seiche Motion in Ocean Ports, W74-04743 2L Investigation of Seiche Activity in West Coast Harbors, W74-04744 2L Flume Experiments on Sand Transport by Waves and Currents,	Summary Report of Metromex Studies, 1971-1972. W74-04509 2B Electric Cloud and Weather Modification with Intense Relativistic Electron Beams, W74-04604 3B WELL ENTRANCE LOSSES Studies on the Validity of Darcy's Law for Flow in Natural Sands, W74-04307 2F WETLANDS Institutional Framework Affecting the Use of Inland Wetlands in Massachusetts, W74-04462 4A WHEAT	W74-04342 51 WIND TRANSPORT The Role of Eolian Processes in the Dynamic of a Shallow Accumulation Coast, W74-04440 2 WIND VELOCITY Physical and Dynamical Scales for Generatio of Wind Waves, W74-04330 2 WIND WAVES Physical and Dynamical Scales for Generatio of Wind Waves, W74-04330 2 Wave Effect on the Coast Formation and Erce
Frequency Distribution, W74-04740 2L Transformation, Breaking and Run-Up of a Long Wave of Finite Height, W74-04741 2L On Non-Saturated Breakers and the Wave Run-Up, W74-04742 2L Effect of Entrance on Seiche Motion in Ocean Ports, W74-04743 2L Investigation of Seiche Activity in West Coast Harbors, W74-04744 2L Flume Experiments on Sand Transport by	Summary Report of Metromex Studies, 1971-1972. W74-04509 2B Electric Cloud and Weather Modification with Intense Relativistic Electron Beams, W74-04604 3B WELL ENTRANCE LOSSES Studies on the Validity of Darcy's Law for Flow in Natural Sands, W74-04307 2F WETLANDS Institutional Framework Affecting the Use of Inland Wetlands in Massachusetts, W74-04462 4A	W74-04342 51 WIND TRANSPORT The Role of Eolian Processes in the Dynamic of a Shallow Accumulation Coast, W74-04440 2 WIND VELOCITY Physical and Dynamical Scales for Generatio of Wind Waves, W74-04330 21 WIND WAVES Physical and Dynamical Scales for Generatio of Wind Waves, W74-04330 22 Wave Effect on the Coast Formation and Ercsion,
Frequency Distribution, W74-04740 2L Transformation, Breaking and Run-Up of a Long Wave of Finite Height, W74-04741 2L On Non-Saturated Breakers and the Wave Run-Up, W74-04742 2L Effect of Entrance on Seiche Motion in Ocean Ports, W74-04743 2L Investigation of Seiche Activity in West Coast Harbors, W74-04744 2L Flume Experiments on Sand Transport by Waves and Currents,	Summary Report of Metromex Studies, 1971-1972. W74-04509 2B Electric Cloud and Weather Modification with Intense Relativistic Electron Beams, W74-04604 3B WELL ENTRANCE LOSSES Studies on the Validity of Darcy's Law for Flow in Natural Sands, W74-04307 2F WETLANDS Institutional Framework Affecting the Use of Inland Wetlands in Massachusetts, W74-04462 4A WHEAT A Comparative Study of the Size and Recep-	W74-04342 51 WIND TRANSPORT The Role of Eolian Processes in the Dynamic of a Shallow Accumulation Coast, W74-04440 2 WIND VELOCITY Physical and Dynamical Scales for Generatio of Wind Waves, W74-04330 2 WIND WAVES Physical and Dynamical Scales for Generatio of Wind Waves, W74-04330 2 Wave Effect on the Coast Formation and Ercsion, W74-04335 2

WIND WAVES

Wave Forecasting Relationships for the Gulf of Mexico,	ZIZANIA-LATIFOLIA Some New Data Concerning Zizania latifolia
W74-04729 2E	(Grisob.) STAPF AND ITS Resources in the Flood Plains of Lower Amur,
VINDS Accumulation on the Devon Island Ice Cap,	W74-04703 2I
Northwest Territories, Canada,	ZONE OF FLOW ESTABLISHMENT
W74-04325 2C	Zone of Flow Establishment for Round Buoyant Jets.
Hurricane Tide Prediction for New York Bay, W74-04343 2L	W74-04657 5B ZOO PLANKTON
Sediment Movement at Indian Ports, W74-04345 2L	Relation Between the Amount of Net Zooplankton and the Depth of Station in Shal-
Developmental History and Present-Day Dynamics of the Chushka Spit,	low Lipno Reservoir, W74-04680 5C
W74-04428 2J	ZOOGENIC DENUDATION
The Elevation, Slope, and Curvature Spectra of	Water Denudation of Molehills in Mountainous Areas.
a Wind Roughened Sea Surface,	W74-04639 2J
W74-04476 2E	
Approximate Estimations of Correlation Coefficient Between Wave Height and Period of Shallow Water Wind Waves,	ZOOPLANKTON Role of Phyto- and Zooplankton in Self-Purifi- cation Processes (Exemplified by Oxidation Ponds), (In Russian),
W74-04761 2L	W74-04692 5G
Modeling of Turbulent Transport in the Surface	Vertical Distribution of Zoobenthos of the
Layer, W74-04795 2D	Mountain River of Adzhar ASSR (In Russian), W74-04818 2I
Propagation of a Finite-Amplitude Surface Wave With Allowance for Random Irregulari-	
ties of the Bottom, W74-04841 2J	
WISCONSIN	
Aerial Radiological Measuring Survey of the Area Surrounding the La Crosse Boiling Water Reactor, Genoa, Wisconsin, July 1968. W74-04447 5A	
Aerial Radiological Measuring Survey of the Area Surrounding the Point Beach Nuclear Plant, Two Creeks, Wisconsin, August 16 and 17, 1970.	
W74-04449 5A	
200 MCD Activated Sludge Plant Removes	
200 MGD Activated Sludge Plant Removes Phosphorus by Pickle Liquor,	
W74-04554 5D	
Detailed Time Variations in Mean Temperature and Heat Content of Some Madison Lakes, W74-04659 2H	
WOOD	
Water in Wood, W74-04545 2I	
YELLOW PERCH	
The Effects of Methoxychlor on Aquatic Biota, W74-04553 5C	
The Preferred Temperature of Fish and Their Midsummer Distribution in Temperate Lakes and Streams.	
W74-04666 5C	
YELLOWSTONE RIVER BASIN (MONT) Evaluation and Simulation of Chemical-Quality	
Data for Five Montana Sampling Stations, W74-04484 2K	
ZINC	
A Preliminary Survey of the Possible Con-	
tamination of Lake Nakuru in Kenya with Some Metals and Chlorinated Hydrocarbon	
Pesticides, W74-04547 5C	

ABDUEV, M. R. Water Regime in Alluvial Fan Soils of the Araks River, (In Russian),	ALEKSASHENKO, A. A. Analytical Methods of Solution of Conjugated Problems in Convective Heat Transfer,	ANDERSON, J. H. Economic Power from Geothermal Heat, W74-04766 4B
W74-04733 2G	W74-04667 8B	
ABRAHAM, G. Hurricane Storm Surge Considered as a	ALEKSASHENKO, V. A. Analytical Methods of Solution of Conjugated	APPLEMAN, R. Effect of Phosphorus Removal Processes on Algal Growth,
Resonance Phenomenon, W74-04332 2L	Problems in Convective Heat Transfer, W74-04667 8B	W74-04552 5C
ADAMS, W. A.	ALEXANDER, R. C.	ASTAKHOVA, T. V. Parasite Fauna of Ctenopharyngodon idella
Viscosity Measurements of Water in Region of Its Maximum Density,	Comments on Johnson's Paper, 'On the Wind- Driven Circulation of a Stratified Ocean',	from Pond- and Spawning-Nursery Fisheries in the Volga Delta, (In Russian),
W74-04518 2K	W74-04675 2E	W74-04702 81
ADEYEMO, M. D. Effect of Beach Slope and Shoaling on Wave Asymmetry,	A Three-Dimensional Model for Estuaries and Coastal Seas: Volume I, Principles of Compu- tation.	ATUK, N. Possible Application of Remote Sensing for Underground Water Exploration in Turkey.
W74-04612 2E	W74-04301 2L	W74-04568 7B
ADZHIMURADOV, K. A. Feeding of Juvenile Carp Cyprinus carpio L. in the Arakum Bodies of Water (Delta of the	ALIEV, S. V. Role of Soil Conditions in the Development of Moths, (In Russian),	AUERBACH, S. I. Annual Consumption of Cesium-137 and Cobalt-60 Labeled Pine Seeds by Small Mam-
Terek River) at Early Developmental Stages, (In Russian),	W74-04640 3F	mals in an Oak-Hickory Forest, W74-04450 5B
W74-04649 2L	ALLAN, G. G. Clarification Method of Polluted Water from	AZAMAYEVA, L. D.
AFIFI, S. S. Thaw Consolidation of Alaskan Silts and	Paper Mills With Combination of Beer Effluent (In Japanese),	Disposal of Radioactive Wastes, W74-04445 5D
Granular Soils, W74-04379 2C	W74-04528 5D	BABAKHANYAN, M. A.
	ALLANSON, B. R. A Report on the Limnology of Monroe Reser-	Effect of Light Intensity on the Quality and
AGNEW, R. Estuarine Currents and Tidal Streams,	voir, Indiana,	Feeding Effectiveness of Green Fodder, (In Russian),
W74-04344 2L	W74-04792 2H	W74-04821 3F
AIBULATOV, N. A.	ALLWOOD, J. K.	BACKEUS, I.
The Role of Eolian Processes in the Dynamics of a Shallow Accumulation Coast,	Research Needs and Priorities: Water Pollution Control Benefits and Costs, Vol. II, W74-04465 5G	Bog Vegetation Re-Mapped after Sixty Years: Studies on Skagershultamossen, Central
W74-04440 2J		Sweden, W74-04683 21
AITKEN, A. P. Hydrologic Investigation and Design in Urban	ALTER, A. J. Water Supply and Waste Disposal Concepts Applicable in Permafrost Regions,	BAHL, R. W.
AreasA Review, W74-04597 2A	W74-04405 5D	Land Value Increments as a Measure of the Net Benefits of Urban Water Supply Projects in Developing Countries: Theory and Measure-
AITKEN, G. W. Some Passive Methods of Controlling	AMONOV, A. A. Morphology and Life Style of the Turkestan	ment,
Geocryological Conditions in Roadway Con-	Gudgeon Gobio gobio lepidolaemus Kessler in Waters of the Sukhan-Darya Basin, (In Rus-	W74-04502 6B
struction, W74-04406 2C	sian),	BAJORUNAS, L. Littoral Transport in the Great Lakes,
	W74-04650 8I	W74-04334 2J
AKAGANE, K. Clarification Method of Polluted Water from	ANCHUTIN, V. M.	BAKER, J. R.
Paper Mills With Combination of Beer Effluent (In Japanese),	Sex Cycle, Spawning and Fertility of West Siberian Crucians in the Steppe Lakes, (In Rus- sian),	A Detailed Investigation of the Sociological, Economic, and Ecological Aspects of Proposed
W74-04528 5D	W74-04689 2H	Reservoir Sites in the Salt River Basin of Ken- tucky,
AKHMEDOV, R. M. Role of Soil Conditions in the Development of	ANDERSON, D. M.	W74-04310 2A
Moths, (In Russian),	Effects of Salt Concentration Changes During Freezing on the Unfrozen Water Content of	BAKER, V. R.
W74-04640 3F	Porous Materials,	Paleohydrology and Sedimentology of Lake Missoula Flooding in Eastern Washington,
AKHVERDOV, S. T.	W74-04802 2C	W74-04599 2E
Effect of Light Intensity on the Quality and Feeding Effectiveness of Green Fodder, (In	Physics, Chemistry, and Mechanics of Frozen Ground: A Review,	BALANI, M. C.
Russian), W74-04821 3F	W74-04373 2C	Thermal Responses in Cirrhina mrigala Fry, W74-04661 50
AKLILU, P.	Soil Development and Patterned Ground Evolution in Beacon Valley Antarctica,	BANARESCU, P.
Flood Proofing Decisions Under Uncertainty: An Application to the Connecticut River Basin,	W74-04372 2G	Types of Distribution Pattern Among Fresh- water Animals, (In Rumanian),
W74-04463 6A	The Unfrozen Water and the Apparent Specific Heat Capacity of Frozen Soils,	W74-04840 21
AKOPYAN, G. A.	W74-04374 2C	BANIN, A.
Effect of Light Intensity on the Quality and Feeding Effectiveness of Green Fodder, (In	ANDERSON, J. A.	Effects of Salt Concentration Changes During Freezing on the Unfrozen Water Content of
Russian),	Anti-Pollution Barge and Conveyer Assembly,	Porous Materials,
W74-04821 3F	W74-04718 5G	W74-04802 2C

BARCILON, A.

BARCILON, A.	BICHAUT, N.	BORTLESON, G. C.
Harmonic Generation of Shallow Water Waves	Influence of Environmental Moisture Condi-	Relative Susceptibility of Lakes to Water-
Over Topography, W74-04323 2E	tions on the Phenol Compound Amount in Cal-	Quality Degradation in the Southern Hood Canal Area, Washington,
W74-04323 2E	luna Vulgaris L., W74-04487 2I	W74-04488 5B
BARICA, J.	W/4-0446/ 21	11 /4-04400
Use of a Silver-Sulfide Electrode for Stan-	BIJKER, E. W.	BOURODIMOS, E. L.
dardizing Aqueous Sulfide Solution in Deter-	Littoral Drift as Function of Waves and Cur-	Wave Reflection and Transmission in Channels
mining Sulfide in Water,	rent,	of Variable Section,
W74-04777 5A	W74-04623 2J	W74-04614 8B
DIRPICED C M		BOWEN, A. J.
BARRAGER, S. M.	BILINSKI, E.	Flume Experiments on Sand Transport by
Benefit of Water Pollution Control on Property Values.	Effects of Cadmium and Copper on the Oxida-	Waves and Currents,
W74-04550 5G	tion of Lactate by Rainbow Trout (Salmo gaird-	W74-04746 2L
W 74-04330	nert) Gills, W74-04780 5C	
BARSOM, G.	W74-04780 5C	BOWERS, C. E.
Multi-Dimensional Aspects of Eddy Diffusion	BINDER, A.	Groundwater Pore Pressures Adjacent to Sub-
Determined by Dye Diffusion Experiments in	Concerning Large-Scale Cultivation of Thermo-	arctic Streams,
Coastal Waters (Summary),	philic Cosmopolitan Mastigocladus Laminousus	W74-04393 2C
W74-04322 2L	Cohn (Cyanophyta) in Icelandic Hot Springs,	BOYLE, J. R.
BARTLE, E. R.	W74-04486 2I	Paper Mill Sludge Disposal on Soils: Effects on
Air Pollution Measurements From Satellites,		the Yield and Mineral Nutrition of Oats (Avena
W74-04485 5A	BISHOP, A. B.	satival.),
W T O TO S	Social, Economic, Environmental, and Techni-	W74-04519 5E
BASCOMB, S.	cal Factors Influencing Water Reuse,	
Identification of Bacteria by Computer: Theory	W74-04317 5D	BRACHET, J.
and Programming,	BLACK, R. F.	Influence of Environmental Moisture Condi-
W74-04791 5A	Growth of Patterned Ground in Victoria Land,	tions on the Phenol Compound Amount in Cal-
DATIBOANNI 12 D	Antarctica,	luna Vulgaris L., W74-04487 2I
BAUMANN, E. R.	W74-04367 2C	W/4-0448/
Trickling Filter-Activated Sludge Combinations for Domestic Wastewater Treatment,		BRANDL, Z.
W74-04798 5D	Origin, Composition, and Structure of Perenni-	Horizontal Distribution of Some Chemical and
W/4-04/76	ally Frozen Ground and Ground Ice: A Review,	Physical Characteristics in Lipno Reservoir,
BAXTER, S. S.	W74-04366 2C	W74-04814 5C
Survey of Facilities Using Land Application of	BLANQUET, R. S.	Deletion Determine the Assessed of Net
Wastewater,	Temperature Acclimation in the Medusa,	Relation Between the Amount of Net
W74-04677 5D	Chrysaora quinquecirrha,	Zooplankton and the Depth of Station in Shal-
BRIDGON G B	W74-04660 5C	low Lipno Reservoir, W74-04680 5C
BEARSON, G. D.	W/4-04000	W 74-04080
Shock-Wave Studies of Ice and Two Frozen	BLONG, R. J.	BRASFEILD, C. W.
Soils, W74-04378 2C	A Numerical Classification of Selected Land-	Wave Action and Breakwater Design, Hamlin
11/4-043/6	slides of the Debris Slide-Avalanche-Flow	Beach Harbor, New York,
BECKER, B. C.	Type,	W74-04588 8B
Approaches to Stormwater Management,	W74-04591 2J	BRECHT, W.
W74-04458 5A	BLOOM, S. C.	Electrolysis as a Purification Method for Ef-
	Heat - A Growing Water Pollution Problem,	fluents of the Pulp and Paper Industry (Die
BEERS, G. D.	W74-04668 5B	Elektrolyse als Reinigungsverfahren fuer Ab-
Management of Stormwater Runoff in Subur-	W/4-04000 3B	waesser der Papier- und Zellstoffindustrie),
ban Environments,	BOCKHEIM, J. G.	W74-04542 5D
W74-04302 5D	Soil Development and Patterned Ground	
BELL, W. H.	Evolution in Beacon Valley Antarctica,	BRETSCHNEIDER, C. L.
Reproduction of Estuarine Structure and Cur-	W74-04372 2G	Modification of Wave Spectra on the Continen-
rent Observation Techniques in the Hecate		tal Shelf and in the Surf Zone,
Model,	BOETTCHER, A. J.	W74-04762 2L
W74-04724 2L	Evaluation of the Ground-Water Supply at	Wave Forecasting Relationships for the Gulf of
	Eight Sites in Glacier National Park,	Mexico.
BERG, R.	Northwestern Montana, W74-04469 2F	W74-04729 2E
Encountering Massive Ground Ice During Road	W/4-04409 2F	
Construction in Central Alaska, W74-04420 4C	BOHN, H. L.	BRIGGS, P. M.
W74-04420 4C	Land Disposal of Waste Gases: 1. Flow Analy-	Waves at Camp Pendleton, California,
The Use of Polyurethane Foam Plastics in the	sis of Gas Injection Systems,	W74-04607 2E
Construction of Expedient Roads on Per-	W74-04479 5E	BRINLEY, W. R. JR.
mafrost in Central Alaska,	POLICIAN III	Potential Use of Airborne Dual-Channel In-
W74-04421 8G	BOLDYREV, V. L.	frared Scanning to Detect Massive Ice in Per-
BEDC B I	Developmental History and Present-Day	mafrost,
BERG, R. L.	Dynamics of the Chushka Spit,	W74-04403 7B
Some Passive Methods of Controlling Geocryological Conditions in Roadway Con-	W74-04428 2J	BROWN I
struction,	Submarine Sand Ridges as Indicators of	BROWN, J. Environmental Considerations for the Utiliza-
W74-04406 2C	Longshore Migration of Sediments,	tion of Permafrost Terrain,
20	W74-04434 2J	W74-04407 2C
BERSELL, P. O.		
Vertical Distribution of Fishes Relative to	BORCHARDT, J. A.	Stratigraphy and Diagenesis of Perennially
Physical, Chemical and Biological Features in	Physicochemical Processes for Water Quality	Frozen Sediments in the Barrow, Alaska, Re-
Two Central Arizona Reservoirs, W74-04474 5C	Control,	gion,
W74-04474 5C	W74-04546 5D	W74-04365 2C

BROWN, J. A. H.	CALLAHAN, J. T.	CLARK, C. C.
Hydrologic Data for Small Rural Catchments in	The Need of Geological Investigations for the	Geophysical Identification of Frozen and Un-
Australia, 1973,	Development of the Ground Water Resources	frozen Ground, Antarctica,
W74-04842 2E	of the Republic of Korea,	W74-04360 2C
	W74-04466 4B	CLARK, D. T.
BROWN, R. J. E.	CAMERON, W. M.	A History and Preliminary Inventory Report on
Distribution of Permafrost in North America	Estuaries,	the Kentucky Radioactive Waste Disposal Site,
and Its Relationship to the Environment: A	W74-04321 2L	W74-04442 5B
Review, 1963-1973, W74-04353 2C	W14-04521 2L	
W 74-04333	CAMFIELD, F. E.	CLARK, J. E.
Influence of Climatic and Terrain Factors on	The Effects of Bottom Configuration on the	Sociocultural Impact of Reservoirs on Local
Ground Temperatures at Three Locations in	Deformation, Breaking and Run-Up of Solitary	Government Institutions, Anthropological
the Permafrost Region of Canada,	Waves,	Analysis of Social and Cultural Benefits and
W74-04348 2C	W74-04613 2E	Costs from Stream Control MeasuresPhase 4, W74-04311 6B
		W /4-04311 0B
BRUNSDEN, D.	A Refraction Study and Program for Periodic	CLAY, A. M.
Slope Development on a Mississippi River	Waves Approaching a Shoreline, and Extend-	Determination of Chromium in Sea Water by
Bluff in Historic Time,	ing Beyond the Breaking Point,	Atomic Absorption Spectrometry,
W74-04585 2J	W74-04340 8B	W74-04516 5A
DESIGNATION D	CARLSON, R. F.	CI PACRY I I
BRUUN, P.	Groundwater Pore Pressures Adjacent to Sub-	CLEASBY, J. L.
Longshore Currents in One and Multi-Bar	arctic Streams.	Physicochemical Processes for Water Quality
Profiles Relation to Littoral Drift,	W74-04393 2C	Control, W74-04546 5D
W74-04749 2L	117 01333	W /4-04346 3D
Quantitative Tracing of Littoral Drift,	Hydrology of the Central Arctic River Basins	CLINE, C. H.
	of Alaska,	A Study of Diffusion in an Estuary,
W74-04617 2J	W74-04304 2A	W74-04333 5B
BRUYNESTEYN, A.		
Effects of Condensates on the Toxicity of	CARVER, R. E.	CLINE, W. R.
Kraft Pulp Mill Effluents,	Studies on the Validity of Darcy's Law for	Cost-Benefit Analysis of Irrigation Projects in
W74-04521 5D	Flow in Natural Sands,	Northeastern Brazil,
30	W74-04307 2F	W74-04565 3F
BUCKMAN, S. J.	C	CLOETE, J. G.
Water Reuse and Deposits Control,	CATHAM, C. E. JR.	Drought and Supplementary Feeding of Sheep
W74-04520 5D	Study of Beach Widening By the Perched	in the Karoo,
35	Beach Concept, Santa Monica Bay, California,	W74-04834 3F
BUICAN, D.	W74-04603 8B	11/1-01054
New Contributions to Biological Study of	CAVALE, R. P.	COELEN, S. P.
Genetic Transmission of Resistance to Dryness		Land Value Increments as a Measure of the
in Double Hybrids of Zea Mays,	Physicochemical Processes for Water Quality	Net Benefits of Urban Water Supply Projects
W74-04833 3F	Control, W74-04546 5D	in Developing Countries: Theory and Measure-
	W/4-04546 3D	ment,
BURBY, R. J. III	CEYNOWA-GIELDON, M.	W74-04502 6B
Multipurpose Reservoirs and Urban Develop-	Observations on the Vegetation of the	COUNT NA NA
ment,	Koronowo Reservoir,	COHN, M. M.
W74-04319 6B	W74-04654 2I	Survey of Facilities Using Land Application of Wastewater,
	-	W74-04677 5D
BURT, W. V.	CHACKO, E. J.	W/4-040//
Verification of Water Temperature Forecasts	Laboratory Experiments to Determine the	COLBECK, S. C.
for Deep, Stratified Reservoirs,	Structural Response of a Vertical Pile Sub-	Effects of Stratigraphic Layers on Water Flow
W74-04807 4A	jected to Wind-Generated Water Waves,	Through Snow,
BUCCH C B	W74-04424 8B	W74-04572 20
BUSCH, C. D.	CHAILED A I D	m. m m 10 0 1: 1
Soil Crusting Related to Sprinkler Intensity,	CHALMERS, J. R.	Water Flow Through Snow Overlying an Im
W74-04560 3F	Southwestern Groundwater Law: A Textual	permeable Boundary,
BUTCHER, W. S.	and Bibliographic Interpretation,	W74-04803 20
Complete Listing of Program Described in Op-	W74-04460 4B	COLLIER, G. F.
timal Operation of Multi-Reservoir Water	CHAMBERLAIN, E.	Spectrophotometric Estimation of Arsenic in
n G .	Mechanical Properties of Frozen Ground	Nitric Acid Extracts of Soil and Soil Additives,
W74-04315 4A	Under High Pressure,	W74-04769 5A
W/1 0/5/5	W74-04375 2C	
Optimal Operation of Multi-Reservoir Water	11770373	COLLINS, J. L.
Resources Systems,	СНІОСІОЛІ, Е. N.	Investigation of Seiche Activity in West Coas
W74-04314 4A	Evaluation of the Use of Pricing as a Tool for	Harbors,
	Conserving Water,	W74-04744 21
BUZZELL, T. D.	W74-04810 3D	COLONELL, J. M.
A Sewage-Treatment Concept for Permafrost	30	Laboratory Experiments to Determine the
Areas,	СНІО G ІОЛ, М. Н.	Structural Response of a Vertical Pile Sub
W74-04419 5D	Evaluation of the Use of Pricing as a Tool for	jected to Wind-Generated Water Waves,
	Conserving Water,	W74-04424 81
CABRERA, J. G.	W74-04810 3D	
Quickelays as Products of Glacial Action: A		COLSON, B. E.
New Approach to Their Nature, Geology, Dis-	CLAR, M. L.	Hydraulic Performance of BridgesExcava
tribution and Geotechnical Properties,	Approaches to Stormwater Management,	tions at Bridges,
W74-04590 2G	W74-04458 5A	W74-04482 8I

COLTON, C.

COLTON, C.	DANIEL, J. F.	DILLARD, J. W.
Social, Economic, Environmental, and Techni-	Water Resources Applications,	Determination of the Complexing Capacity of
cal Factors Influencing Water Reuse,	W74-04584 7B	Natural Water,
W74-04317 5D		W74-04312 2K
	DANIELSON, T. W.	
COONEY, M. K.	Lakes in the Boulder-Fort Collins-Greeley	DINGMAN, S. L.
Relative Efficiency of Cell Cultures for Detec-	Area, Front Range Urban Corridor, Colorado,	Effects of Permafrost on Stream Flow Charac-
tion of Viruses,	W74-04496 2H	teristics in the Discontinuous Permafrost Zone
W74-04767 5A	DAS, M. M.	of Central Alaska,
CODIEV I B	Waves Generated by Horizontal Motion of a	W74-04392 2C
CORLEY, J. P. Environmental Surveillance for Fuel Fabrica-	Wall,	The Water Balance in Arctic and Subarctic Re-
tion Plants.	W74-04760 8B	gionsAnnotated Bibliography and Preliminary
W74-04451 5B		Assessment,
W/4-04-51	DAUPHIN, C.	W74-04601 2C
COSTA, J. E.	Death of the Marshes in the Ardennes,	W 74-04001 2C
Response and Recovery of a Piedmont	W74-04686 4A	DION, N. P.
Watershed from Tropical Storm Agnes, June	DANIBON D. D.	A Proposal for the Investigation of Possible
1972.	DAVIDSON, D. D. Study of Beach Widening By the Perched	Ground-Water Contamination in the Bangor
W74-04805 2J	Beach Concept, Santa Monica Bay, California,	Area, Kitsap County, Washington,
	W74-04603 8B	W74-04491 5B
COUGHLIN, R. E.	W /4-04003	
Estimating the Benefits of Stream Valley and	DAVIDSON, H. J.	DIVOKY, D.
Open Space Preservation Projects,	Water Quality Records for the Hubbard Creek	Shallow Water Waves: A Comparison of Theo-
W74-04500 6B	Watershed, Texas, October 1969-September	ries and Experiments,
	1972,	W74-04609 2E
COUVER, J. E.	W74-04606 5B	
Physicochemical Processes for Water Quality		DIXON, P. S.
Control,	DAVIS, J. C.	Effect of Phosphorus Removal Processes on
W74-04546 5D	Bioassay Procedures to Evaluate Acute Toxici-	Algal Growth,
	ty of Neutralized Bleached Kraft Pulp Mill Ef-	W74-04552 5C
COWAN, M. C.	fluent to Pacific Salmon,	
Relations Between Soil Water Potential and	W74-04779 5C	DOANE, W. M.
Disease in Wheat Seedlings Infected by Puc-		Mercury Removal from Waste Water with
cinia recondita,	DE GOEIJ, J. M.	Starch Xanthate-Cationic Polymer Complex,
W74-04653 3F	A Preliminary Survey of the Possible Con-	W74-04541 5D
CRAMPTON C P	tamination of Lake Nakuru in Kenya with	
CRAMPTON, C. B.	Some Metals and Chlorinated Hydrocarbon	DOLAR, S. G.
A Geoecological Terrain Analysis of Discon-	Pesticides,	Paper Mill Sludge Disposal on Soils: Effects on
tinuously Frozen Ground in the Upper Macken-	W74-04547 5C	the Yield and Mineral Nutrition of Oats (Avena
zie River Valley, Canada,	DE VAHL DAVIS, G.	satival.),
W74-04354 2C	Application of the Finite Element Method to	W74-04519 5E
CRAWFORD, A. B.	Convection Heat Transfer Between Parallel	
	Planes,	DOLOTOV, Y. S.
Social, Economic, Environmental, and Techni-	W74-04765 8B	Certain Structural and Developmental Coastal
cal Factors Influencing Water Reuse,	W /4-04/03	Features in the South of the Maritime Territo-
W74-04317 5D	DEAN, R. G.	ry,
CRORY, F. E.	Breaking Wave Criteria; A Study Employing a	W74-04432 2J
Settlement Associated with the Thawing of Per-	Numerical Wave Theory,	
mafrost,	W74-04610 2E	DONCHEVA, I.
W74-04408 2C		Productivity and Grain Qualities of Certain
11/4-04400	DEGEN, I.	Newly Developed Native and Foreign Wheat
CROWDER, D. G.	Water Problems of the Tisza River in Hungary	Varieties Grown Under Irrigation, (In Bulgari-
Hypochlorination of Polluted Storm-Water	and Cooperation Among Tisza Basin Countries	an),
Pumpage at New Orleans,	in the Field of Water Management (Vodnyye	W74-04832 3F
W74-04676 5D	problemy reki Tisy v Vengrii i sotrudnichestvo	
30	stran basseyna Tisy v oblasti vodnogo khoz-	DONNELLY, T. G.
CURTIS, M. A.	vayst va),	Multipurpose Reservoirs and Urban Develop-
Identification of Bacteria by Computer: Theory	W74-04574 4A	ment,
and Programming,	DEMORPHENS & I	W74-04319 6B
W74-04791 5A	DEMORRETES, B. L.	
	Contribution to Knowledge about the Leaf	DORHEIM, F. H.
D'SOUZA, L.	Anatomy of Species of a 'Caatinga' of the Rio	Hydrogeologic Considerations in Solid Waste
A Comparative Study of the Size and Recep-	Negro (Amazon), (In Portuguese),	Storage in Iowa: Part 1. Sanitary Landfill Site
tivity of the Stigma in Wheat, Rye, Triticale	W74-04682 2I	Selection: Part 2. A Method of Hazardous and
and Secalotricum,	DEMOYER, R.	Toxic Waste Disposal,
W74-04690 3F	Mathematical Modeling for Status Prediction	W74-04592 5E
	and Control of Water Distribution Systems,	
DAICOFF, D. W.	W74-04320 4A	DORNBUSCH, D. M.
Capitalization of the Benefits of Water		Benefit of Water Pollution Control on Property
Resource Development,	DEMPSTER, G. R. JR.	Values,
W74-04501 6B	Effects of Urbanization on Floods in the Dal-	W74-04550 5G
DAI BYE II I	las, Texas, Metropolitan Area,	DRABER I
DALPKE, H-L.	W74-04483 4C	DRAPER, L.
Electrolysis as a Purification Method for Ef-		Waves at Camp Pendleton, California,
fluents of the Pulp and Paper Industry (Die	DEUTSCH, M.	W74-04607 2E
Elektrolyse als Reinigungsverfahren fuer Ab-	Operational and Experimental Remote Sensing	Waves Off Benghazi Harbour - Libva.
waesser der Papier- und Zellstoffindustrie),	in Hydrology,	
W74-04542 5D	W74-04570 7B	W74-04608 2L

2L

DRUCKER, P.	EMERSON, S.	FEUILLADE, J.
Sociocultural Impact of Reservoirs on Local	Distribution and Uptake of Artificially In-	Comparative Study, in 1966 and 1967, of Three
Government Institutions, Anthropological		Reservoirs in the Project of a Natural Park in
	troduced Radium-226 in a Small Lake,	
Analysis of Social and Cultural Benefits and	W74-04785 5B	the Morvan Region (In French),
Costs from Stream Control Measures-Phase 4,		W74-04815 SC
W74-04311 6B	EMERY, R. M.	PROPERTY AND AS
	Nutrient Income Change Related to Plankton	FEUILLADE, M.
DUERR, A. D.	Algae,	Comparative Study, in 1966 and 1967, of Three
Hydrologic and Geologic Considerations for		Reservoirs in the Project of a Natural Park in
Solid-Waste Disposal in West-Central Florida,	W74-04318 5C	the Morvan Region (In French),
		W74-04815 5C
W74-04605 5E	EMMETT, W. W.	***************************************
DUCAN D D	Suspended and Bedload Sediment Transport in	FEY, D.
DUGAN, P. R.	the Snake and Clearwater Rivers in the Vicinity	Changes in the Avifauna of the Biesbosch in
Biochemical Ecology of Water Pollution,	of Lewiston, Idaho,	
W74-04523 5C		the 1st Yr After the Elimination of the Tide,
	W74-04846 2J	W74-04699 21
DUNAWAY, P. B.		
Annual Consumption of Cesium-137 and	ERMOLAEV, V. I.	FICKE, J. F.
Cobalt-60 Labeled Pine Seeds by Small Mam-	The Phytoplankton Productivity in the Pyasina	Lakes in the Boulder-Fort Collins-Greeley
mals in an Oak-Hickory Forest,	River Near Tareya Village (Western Taimyr),	Area, Front Range Urban Corridor, Colorado,
	(In Russian),	W74-04496 2H
W74-04450 5B	W74-04698 2I	
P. CT PACK P. C	W /4-04076 21	FIELD, B. H.
EAGLESON, P. S.		
Growth of Longshore Currents Downstream of	ERNEST, L. A.	Skimmer Trap,
a Surf-Zone Barrier,	200 MGD Activated Sludge Plant Removes	W74-04713 5G
W74-04324 2J	Phosphorus by Pickle Liquor,	STORED I O
" "	W74-04554 5D	FISHER, J. C.
Linear Systems Technique Applied to	1174-04554	Quantity and Chemical Quality of Low Flow in
	PROPER D. C.	the East Fork San Jacinto and West Fork San
Hydrologic Data Analysis and Instrument	ESCH, D. C.	Jacinto Rivers near Houston, Texas, June 24,
Evaluation: A Case Study on Data from the	Control of Permafrost Degradation Beneath a	26, 1969,
Alice Springs Area,	Roadway by Subgrade Insulation,	
W74-04470 2A	W74-04409 4C	W74-04481 5B
	117707107	
ECKERMAN, K.	FARKAS, T.	FISHER, L. J.
A Radiological Environmental Survey at EBR-		An Annotated Bibliography of Flushing and
	A Possible Explanation for the Differences in	Dispersion in Tidal Waters,
II,	the Fatty Acid Composition of Fresh-Water	W74-04731 2L
W74-04455 5B	and Marine Fishes,	
	W74-04688 5C	FOKINA, V. D.
EDELMAN, T.	11/1-01000	Problem of Pure Water in the USA, (In Rus-
Some Characteristics of the Dutch Coast,	PARRICTON I W	
W74-04754 2J	FARRINGTON, J. W.	sian),
1177 07737	Analytical Techniques for the Determination of	W74-04837 50
EFANOVA, A. I.	Petroleum Contamination in Marine Organisms,	
	W74-04594 5A	FOSTER, J. H.
The Effect of Water Spraying on the Rein-	WITTOWN SA	Institutional Framework Affecting the Use of
Forcement of Physiological Process in Cotton	FEDDER B A	Inland Wetlands in Massachusetts,
Plants,	FEDDES, R. A.	W74-04462 4A
W74-04823 3F	Water Withdrawal by Plant Roots,	117 07702
	W74-04655 3F	FOURNIER, R. O.
EGGINK, D. N.		The Transport of Organic Carbon to Organisms
Some Characteristics of the Dutch Coast,	FEE, E. J.	
		Living in the Deep Oceans,
W74-04754 2J	Diurnal Variation of Dissolved Inorganic Car-	W74-04790 50
DOCUMENT D	bon and its Use in Estimating Primary Produc-	
EGGINTON, P.	tion and CO2 Invasion in Lake 227,	FOXWORTHY, B. L.
Thermokarst Development, Banks Island,	W74-04784 5A	Relative Susceptibility of Lakes to Water
Western Canadian Arctic,	11/10/2015	Quality Degradation in the Southern Hood
W74-04368 2C	A Numerical Model for Determining Integral	
20		Canal Area, Washington,
EISELE, P. J.	Primary Production and Its Application to Lake	W74-04488 5I
	Michigan,	POVINODTHY 1 F
The Effects of Methoxychlor on Aquatic Biota,	W74-04786 5C	FOXWORTHY, J. E.
W74-04553 5C		Multi-Dimensional Aspects of Eddy Diffusion
	FERGUSON, R. G.	Determined by Dye Diffusion Experiments in
ELGMORK, K.	The Preferred Temperature of Fish and Their	Coastal Waters (Summary),
Polluted Snow in Southern Norway During the		W74-04322 21
Winters 1968-1971,	Midsummer Distribution in Temperate Lakes	
W74-04652 5B	and Streams,	FRANKIGNOUL, C. J.
11. T 01032	W74-04666 5C	Special Analysis of Short Inertial-Interna
ELLIS, G. E.		
	FERRI, M. G.	Wave Records,
Investigation of Seiche Activity in West Coast	Contribution to Knowledge about the Leaf	W74-04489 21
Harbors,	Anatomy of Species of a 'Caatinga' of the Rio	PR 13770 1
W74-04744 2L		FRANKO, A.
	Negro (Amazon), (In Portuguese),	Distribution of Organic Matter and Bacteria is
ELVIN, D. W.	W74-04682 2I	the Upper Layer of Bottom Deposit of Lak
Inshore Sea Surface Temperature and Salinity		Balaton,
Conditions at Agate Beach, Yaquina Bay and	FERRIANS, O. J. JR.	W74-04839 51
	Mapping and Predicting Permafrost in North	11 / 1-01037
Whale Cove, Oregon, in 1970,		EDEIREDCED U I
W74-04730 2L	America: A Review, 1963-1973,	FREIBERGER, H. J.
	W74-04398 2C	Effects of Backpumping from South New
EMERSON, M. J.		River Canal at Pump Station S-9 on Quality of
State-of-Art Review: Water Pollution Control	Permafrost-Related Engineering Geology	Water in Water-Conservation Area 3, Browar
Benefits and Costs, Vol I,	Problems Posed by the Trans-Alaska Pipeline,	County, Florida,
W74-04464 5G	W74-04416 8D	W74-04600 51
30	00	

5B

FRENCH, H. M.

FRENCH, H. M.	GAUFIN, A. R.	GOLD, R.
Thermokarst Development, Banks Island,	Water Quality Requirements of Aquatic In-	A Radiological Environmental Survey at EBR-
Western Canadian Arctic,	sects,	II,
W74-04368 2C	W74-04551 5C	W74-04455 5B
EDVADED M II	GAWRON, E.	COLDCHITT II
FRIMPTER, M. H. Chemical Quality of Streams, Allegheny River	The Effect of Collecting Time and Grain Size	GOLDSMITH, V.
Basin and Part of the Lake Erie Basin, New	on the Sampling of Stream Sediments for	Drastic Beach Changes in a Low-Energy En- vironment Caused by Hurricane Betsy,
York.	Geochemical Mapping in the St. Catharines	W74-04756 2J
W74-04593 2K	Area, Ontario,	W 74-04730 23
	W74-04587 2J	GONOR, J. J.
FROMM, P. O.	CRIPER W.	Inshore Sea Surface Temperature and Salinity
Mercury Uptake and Ion Distribution in Gills	GBUREK, W. J. Soluble Phosphate Output of an Agricultural	Conditions at Agate Beach, Yaquina Bay and
of Rainbow Trout (Salmo gairdneri): Tissue	Watershed in Pennsylvania,	Whale Cove, Oregon, in 1970,
Scans with an Electron Microprobe,	W74-04804 5B	W74-04730 2L
W74-04778 5A	W/4-04004 3B	
FROST, L. R. JR.	GEBHART, B.	GOODMAN, M. Y.
Evaluation and Simulation of Chemical-Quality	On the Stability of Laminar Plumes: Some Nu-	Mathematical Modeling for Status Prediction
Data for Five Montana Sampling Stations,	merical Solutions and Experiments,	and Control of Water Distribution Systems,
W74-04484 2K	W74-04662 5B	W74-04320 4A
	GEDEONOV, L. I.	GOODSPEED, M. J.
FROST, V. E.	Environmental Radioactivity,	Linear Systems Technique Applied to
Eutrophication of Lake 227 by Addition of	W74-04456 5B	Hydrologic Data Analysis and Instrument
Phosphate and Nitrate: The Second, Third, and	W/4-04/30	Evaluation: A Case Study on Data from the
Fourth Years of Enrichment, 1970, 1971, and	GEORGE, W.	Alice Springs Area,
1972,	Analysis of the Proposed Little Chena River,	W74-04470 2A
W74-04789 5C	Earthfilled Nonretention Dam, Fairbanks,	W/+04/10
Production of Epilithiphyton in Two Lakes of	Alaska,	GORDON, D. C. JR.
the Experimental Lakes Area, Northwestern	W74-04412 8D	Laboratory Studies of the Accommodation of
Ontario,	CIESE C S	Some Crude and Residual Fuel Oils in Sea
W74-04787 5C	GIESE, G. S.	Water,
30	Wave Period and the Swash Zone Energy Balance,	W74-04775 5B
FROULA, N. H.	W74-04622 2J	
Sound and Shock Transmission in Frozen	W 74-04022	GORDON, D. L.
Soils,	GILBERT, T. R.	Hydrogeologic Considerations in Solid Waste
W74-04383 2C	Determination of Chromium in Sea Water by	Storage in Iowa: Part 1. Sanitary Landfill Site
	Atomic Absorption Spectrometry,	Selection: Part 2. A Method of Hazardous and
FULWIDER, C. W.	W74-04516 5A	Toxic Waste Disposal,
Thermal Regime in an Arctic Earthfill Dam,	CILL D	W74-04592 5E
W74-04410 8D	GILL, D.	COTCONA N
GABE, D. R.	A Spatial Correlation Between Plant Distribu- tion and Unfrozen Ground Within a Region of	GOTSOVA, V.
Overgrowth of Ooze Iron-Manganese Microor-	Discontinuous Permafrost,	Productivity and Grain Qualities of Certain
ganisms Studied by Electron Microscopy, (In	W74-04355 2C	Newly Developed Native and Foreign Wheat
Russian),	1177-04333	Varieties Grown Under Irrigation, (In Bulgari-
W74-04558 5A	GILLEY, J. R.	an), W74-04832 3F
	A Simulation Model for Evaluating Irrigation	W 74-04032
GAITHER, W. S.	Management Practices,	GOVE, G.
Research in the Coastal and Oceanic Environ-	W74-04564 3F	1972 Review of the Literature on Pulp and
ment. A Summary of Research Accomplished	GILMAN, H. D.	Paper Effluent Management,
Under Project Themis,	Mathematical Modeling for Status Prediction	W74-04540 5D
W74-04732 2L	and Control of Water Distribution Systems,	
GARG, O. P.	W74-04320 4A	GRANBERG, H. B.
In Situ Physicomechanical Properties of Per-	***************************************	Indirect Mapping of the Snowcover for Per-
mafrost Using Geophysical Techniques,	GISSER, M.	mafrost Prediction at Schefferville, Quebec,
W74-04399 2C	Economic Aspects of Ground Water Resources	W74-04356 2C
	and Replacement Flows in Semiarid Agricul-	Demofrest and Conveyer Polationships Noon
GARTSMAN, I. N.	tural Areas,	Permafrost and Snowcover Relationships Near
Topology of River Systems and Hydrographic	W74-04563 4B	Schefferville, W74-04362 2C
Indicator Studies (Topologiya rechnykh sistem	GIURCA, R.	W 74-04302 2C
i gidrograficheskiye indikatsionnyye iss-	Syngnathus nigrolineatus nigrolineatus	GRIGGS, M.
ledovaniya),	(Eichwald) in the Frasinet River and Mostistea	Air Pollution Measurements From Satellites,
W74-04578 2A	Lake, (In Rumanian),	W74-04485 5A
GASKIN, D. A.	W74-04700 2I	
Control of Culvert Icing,	CI PAIN P	GRIJM, W.
W74-04411 4C	GLENNE, B. Constituent Transport in Estuaries,	Theoretical Forms of Shorelines,
	W74-04627 2L	W74-04336 2J
GASKIN, P. N.		CDDAGE H I ID
Pore Water and Heaving Pressures Developed	GOEMAAT, R. L.	GRIMME, H. L. JR.
in Partially Frozen Soils,	Reconnaissance of the Ground-Water	Water Cleaning Treatment,
W74-04389 2C	Resources of Cimarron County, Oklahoma,	W74-04710 3A
GASPARYAN, O. B.	W74-04495 4B	GRISWOLD, G. M.
Effect of Light Intensity on the Quality and	GOLD, L. W.	A Review of Oceanographic Variables and
Feeding Effectiveness of Green Fodder, (In	Thermal Conditions in PermafrostA Review	Their Analyses and Predictions Over the Con-
Russian),	of North American Literature,	tinental Shelf,
W74-04821 3F	W74-04347 2C	W74-04329 2L

GRITTON, E. C. The Application of Numerical Simulation	HANSEN, D. V. New Dimensions in Estuary Classification,	HESSLEIN, R. Distribution and Uptake of Artificially In-
Models in the Assessment of the Effect of Discharges into Coastal Waters,	W74-04735 2L	troduced Radium-226 in a Small Lake, W74-04785 5B
W74-04674 5B	HANUS, H.	нідисні, н.
GROSE, P.	Influences of Soil Density, Clay Silt and Humus Content on Measurements of Soil	Hydraulic Model Experiment on the Duffusion
Drastic Beach Changes in a Low-Energy En-	Water by Neutron Gauges, (In German),	Due to the Coastal Current, W74-04628 5B
vironment Caused by Hurricane Betsy, W74-04756 2J	W74-04556 2G	W74-04628 5B
	HARDER, J. A.	HILLBRICHT-ILKOWSKA, A.
GUPTA, T. R. Institutional Framework Affecting the Use of	The Analysis of Harbor and Estuary Systems, W74-04745 2L	Morphological Variation of Keratella cochlearis (Gosse) (Rotatoria) in Several Masurian Lakes
Inland Wetlands in Massachusetts, W74-04462 4A	_	of Different Trophic Level, W74-04696 5C
	HARKINS, J. R.	W 74-04090
GURVICH, V. V. Micro- and Mesobenthos Development as a	Surface-Water Availability, Lauderdale Coun- ty, Alabama,	HIRST, E.
Factor of Soil Composition (In Russian),	W74-04494 2E	Zone of Flow Establishment for Round Buoyant Jets,
W74-04816 2H	WARREN LO	W74-04657 5B
HADDAD, G.	HARLETT, J. C. The Effect of Waves on the Profile of a Natu-	NORSON C D
Rainfed Rice in Southern Senegal: Evaluation	ral Beach.	HOBSON, G. D. Mapping and Predicting Permafrost in North
of Three Years' Experimentation (1966-1969),	W74-04620 2J	America: A Review, 1963-1973,
(In French), W74-04829 3F	TARREDO W Y	W74-04398 2C
W74-04829 3F	HARTBERG, W. K. Aedes aegypti and Aedes simpsoni Breeding in	HOCUTT, C. H.
HAGEN, A.	Coral Rock Holes on the Coast of Tanzania,	Hybridization Between the Darters Percina
Polluted Snow in Southern Norway During the	W74-04697 2I	crassa roanoka and Percina oxyrhyncha
Winters 1968-1971, W74-04652 5B	HARVEY A C	(Percidae, Etheostomatini), with Comments on
	HARVEY, A. G. Measurement of Moisture Diffusivity of Wet	the Distribution of Percina crassa roanoka in New River,
HAKONSON, T. E.	Swelling Systems,	W74-04472 2E
Ecodistribution of Plutonium in Liquid Waste Disposal Areas at Los Alamos,	W74-04493 2G	
W74-04443 5B	WARPIN D W	HOEKSTRA, P. Electromagnetic Probing of Permafrost,
WATERWELL A D	HASKELL, E. H. State Environmental Management, Case Stu-	W74-04400 20
HALLIWELL, A. R. Shear Velocity in a Tidal Estuary,	dies of Nine States,	
W74-04629 2L	W74-04503 5G	HOKANSON, K. E. F. Temperature Requirements for Embryos and
HALMANN, M.	HAWS, F. W.	Larvae of the Northern Pike, Esox lucius
Chemical Ecology: Evidence for Phosphate as	A Study of Water Institutions in Utah and	(Linnaeus),
the Only Factor Limiting Algal Growth in Lake	Their Influence on the Planning, Developing,	W74-04670 50
Kinneret, W74-04685 5C	and Managing of Water Resources,	HOLT, J. J.
W 74-04083	W74-04316 6E	Drastic Beach Changes in a Low-Energy En-
HAMBRICK, P. S.	HEALD, W. R.	vironment Caused by Hurricane Betsy, W74-04756
Hybridization Between the Darters Percina crassa roanoka and Percina oxyrhyncha	Soluble Phosphate Output of an Agricultural	W /4-04/30
(Percidae, Etheostomatini), with Comments on	Watershed in Pennsylvania, W74-04804 5B	HOLUBEC, I.
the Distribution of Percina crassa roanoka in	W74-04804 5B	Laboratory Study of Self-Sealing Limestone Plugs for Mine Openings,
New River, W74-04472 2E	HEGINBOTTOM, J. A.	W74-04559 50
	Some Effects of Surface Disturbance on the	HOM MA M
HAMILTON, R. D.	Permafrost Active Layer at Inuvik, N.W.T., Canada.	HOM-MA, M. Field Investigation Practices of Coastal Studies
Heterotrophic Utilization of Sucrose in an Ar- tificially Enriched Lake,	W74-04413 4C	in Japan,
W74-04781 5C	HENDRICKON I A	W74-04625 21
Measurement of Adenosine Triphosphate	HENDRICKSON, J. A. Feasibility Study for a Surge-Action Model of	Rhythmic Pattern of Longshore Bars Related to
(ATP) in Two Precambrian Shield Lakes of	Monterey Harbor, California,	Sediment Characteristics,
Northwestern Ontario,	W74-04721 2L	W74-04750 2.
W74-04782 5B	HENNION, F. B.	Suspended Sediment Due to Wave Action,
HAMM, D. W.	Corps of Engineers Technology Related to	W74-04747 2
Statistical Analysis of Hydrograph Charac-	Design of Pavements in Areas of Permafrost,	HOPWOOD, A. P.
teristics for Small Urban Watersheds, W74-04459 2A	W74-04414 4C	Method and Apparatus for Treating Effluent,
	HENRY, R. F.	W74-04714 5E
HAMMER, T. R.	Special Analysis of Short Inertial-Internal	HORICK, P. J.
Estimating the Benefits of Stream Valley and Open Space Preservation Projects,	Wave Records,	Mississippian Aquifer of Iowa,
W74-04500 6B	W74-04489 2E	W74-04843 70
HAMMOND, A. L.	HENRY, V. J. JR.	HORIKAWA, K.
Breeder Reactors: Power for the Future,	Development and Geologic Significance of Soft	Suspended Sediment Due to Wave Action,
W74-04656 8C	Beach Sand,	W74-04747 2
HANCK, K. W.	W74-04757 2J	HOWELL, D. T.
Determination of the Complexing Capacity of	Rhomboid Ripple Mark, Indicator of Current	A Design Procedure for the Conjunctive Use of
Natural Water,	Direction and Environment,	Surface and Groundwater Storages,
W74-04312 2K	W74-04739 2J	W74-04598 41

HOYT, J. H.	IVES, J. D.	JOHNSTON, G. H.
Development and Geologic Significance of Soft	Permafrost and Its Relationship to Other En-	Engineering Design and Construction in Per-
Beach Sand, W74-04757 2J	vironmental Parameters in a Midlatitude, High- Altitude Setting, Front Range, Colorado Rocky	mafrost Regions: A Review, W74-04404 8D
High-Angle Beach Stratification, Sapelo Island,	Mountains, W74-04357 2C	Evaluation of in Situ Creep Properties of
Georgia, W74-04738 2J	IWAGAKI, Y.	Frozen Soils with the Pressuremeter, W74-04377 2C
Rhomboid Ripple Mark, Indicator of Current	Hydraulic Model Experiment on the Duffusion	
Direction and Environment,	Due to the Coastal Current, W74-04628 5B	JOHNSTON, J. W. Environmental Surveillance for Fuel Fabrica-
W74-04739 2J		tion Plants, W74-04451 5B
HSIAO, T. C. Changes in Enzymes in the Plant as Related to	Hyperbolic Waves and Their Shoaling, W74-04611 2E	W/4-04431
Water Supply and Usage, W74-04306 21	Laboratory Study of Scale Effects in Two-	JOHNSTON, P. R. A Design Procedure for the Conjunctive Use of
	Dimensional Beach Processes,	Surface and Groundwater Storages, W74-04598 4B
Plant Responses to Water Stress, W74-04539 2I	W74-04748 2L	
	JAHN, W.	JONAS, R. E. E.
HUFFAKER, R. C. Changes in Enzymes in the Plant as Related to	Ecological Investigations of Ponds with Special Regard to the Consequences of Water Pollution	Effects of Cadmium and Copper on the Oxida- tion of Lactate by Rainbow Trout (Salmo gaird-
Water Supply and Usage, W74-04306 2I	by Oil, (In German), W74-04635 5C	nert) Gills, W74-04780 5C
HUMBLE, D. E.	W 74-04633	
Lime Disinfection of Sewage Bacteria at Low	JAHNS, H. O. Permafrost Protection for Pipelines,	JONCA, E. Water Denudation of Molehills in Mountainous
Temperature. W74-04548 5D	W74-04415 2C	Areas, W74-04639 2J
HUNTER, J. A. M.	JANNASCH, H. W.	W74-04639 2J
The Application of Shallow Seismic Methods to	A Bacteriological Pressure-Retaining Deep-Sea	JONES, B. R. Temperature Requirements for Embryos and
Mapping of Frozen Surficial Materials, W74-04401 2C	Sampler and Culture Vessel, W74-04773 5A	Larvae of the Northern Pike, Esox lucius
HUNTER, J. S. III.	JAROCKI, W.	(Linnaeus), W74-04670 5C
Allocation of Funding for Wastewater Treat-	Wave Effect on the Coast Formation and Ero-	
ment Facilities,	sion,	JONES, S. J.
W74-04562 5D	W74-04335 2J	Radio Depth-Sounding on Meighen and Barnes Ice Caps, Arctic Canada,
HURST, G. E.	JEFFREYS, H.	W74-04571 2C
Apparatus for Treating Waste Fluids by Means of Dissolved Gases,	Waves and Tides Near the Shore,	JORDENING, D. L.
W74-04719 5D	W74-04758 2L	Research Needs and Priorities: Water Pollution
HWANG, C. T.	JEFFUS, H. M. Mathematical Modeling of Stream Storage	Control Benefits and Costs, Vol. II, W74-04465 5G
Thermal Disturbance Due to Channel Shifting, Mackenzie Delta, N.W.T., Canada,	Potential,	State-of-Art Review: Water Pollution Control
W74-04351 2C	W74-04305 2E	Benefits and Costs, Vol I,
ICHIMURA, S.	JELESNIANSKI, C. P.	W74-04464 5G
Ecological Characteristics of Go-No-Ike Lake, W74-04638 5C	Numerical Computations of Storm Surges with	JUDGE, A. S.
	Bottom Stress, W74-04759 2L	Deep Temperature Observations in the Canadi-
IJIMA, T. Approximate Estimations of Correlation Coef-		an North, W74-04349 2C
ficient Between Wave Height and Period of	JENNINGS, D. E. A Detailed Investigation of the Sociological,	JUDKINS, J. F. JR.
Shallow Water Wind Waves, W74-04761 2L	Economic, and Ecological Aspects of Proposed	Color Removal from Textile Dye Waste by
A Study of Critical Depth and Mode of Sand	Reservoir Sites in the Salt River Basin of Ken- tucky.	Coagulation, W74-04303 5D
Movement Using Radioactive Glass Sand,	W74-04310 2A	
W74-04752 2J	JERNIGAN, C. L.	JUMIKIS, A. R. Effect of Porosity on Amount of Soil Water
IL'INSKII, I. I.	Soil Crusting Related to Sprinkler Intensity,	Transferred in a Freezing Silt,
Hygienic Efficiency of Measures for Protecting Surface Waters in Uzbek SSR, (In Russian),	W74-04560 3F	W74-04376 2C
W74-04838 5F	JOHNSON, J. W.	JUSTICE, C. A.
INMAN, D. L.	Tracing Coastal Sediment Movement by Naturally Radioactive Minerals,	Effect of Phosphorus Removal Processes on Algal Growth,
Flume Experiments on Sand Transport by Waves and Currents,	W74-04753 2J	W74-04552 5C
W74-04746 2L	JOHNSON, L. J.	KACHADOORIAN, R.
IONIN, A. S.	Ecodistribution of Plutonium in Liquid Waste	Permafrost-Related Engineering Geology
Some Results of Regional Coastal Investiga- tions in the USSR,	Disposal Areas at Los Alamos, W74-04443 5B	Problems Posed by the Trans-Alaska Pipeline, W74-04416 8D
W74-04426 2J	JOHNSTON, E. A.	KALANTYRENKO, I. I.
IPPEN, A. T.	Surface- and Ground-Water Conditions During	Calculation of the Concentration of the
Wave Reflection and Transmission in Channels of Variable Section,	1959-61 in a Part of Flett Creek Basin, Tacoma, Washington,	Biomass of Blue-Green Algae During Settling, (In Russian).
W74-04614 8B	W74-04796 2E	W74-04645 5C

Market and the second s		
KALINA, G. P. Salmonella Serotypes in Sewage of Various	KEMP, P. H. The Relationship Between Wave Action and Beach Profile Characteristics,	KLING, H. Eutrophication of Lake 227 by Addition of Phosphate and Nitrate: The Second, Third, and
Origins, W74-04850 5B	W74-04331 2J	Fourth Years of Enrichment, 1970, 1971, and
TANET A M	PENDEN I E	1972,
KAMEL, A. M. Tracing Coastal Sediment Movement by Natu-	KENNEDY, J. F. A Laboratory Investigation of Free Surface	W74-04789 5C
rally Radioactive Minerals.	Flows Over Wavy Beds,	KNIGHT, A. L.
W74-04753 2J	W74-04477 8B	Surface-Water Availability, Lauderdale Coun- ty, Alabama.
KANE, D. L.	KENNING, D. B. R.	W74-04494 2E
Groundwater Pore Pressures Adjacent to Sub-	Convective Heat Transfer to Water Containing	
arctic Streams,	Bubbles: Enhancement not Dependent on Ther-	KNIGHT, J. H. On Solving the Unsaturated Flow Equation: 2.
W74-04393 2C	mocapillarity,	Critique of Parlange's Method.
Hydrology of the Central Arctic River Basins	W74-04664 8B	W74-04492 2G
of Alaska,	KEPCZYNSKI, K.	KOEMAN, J. H.
W74-04304 2A	Observations on the Vegetation of the	A Preliminary Survey of the Possible Con-
Recharge of a Central Alaska Lake by Subper-	Koronowo Reservoir, W74-04654 2I	tamination of Lake Nakuru in Kenya with Some Metals and Chlorinated Hydrocarbon
mafrost Groundwater, W74-04394 2F	TRANK N. II	Pesticides,
W/4-04394 2F	KESEL, R. H. Slope Development on a Mississippi River	W74-04547 5C
KAO, Y. S.	Bluff in Historic Time,	KOERNER, R. M.
Convective Heat Transfer to Water Containing	W74-04585 2J	Accumulation on the Devon Island Ice Cap,
Bubbles: Enhancement not Dependent on Ther- mocapillarity,	VIIACUATRVAN N A	Northwest Territories, Canada,
W74-04664 8B	KHACHATRYAN, N. A. Effect of Light Intensity on the Quality and	W74-04325 2C
VADI IN D. A.	Feeding Effectiveness of Green Fodder, (In	KONDO, T.
KAPLIN, P. A. Some Results of Regional Coastal Investiga-	Russian),	Color of Pulp Industry Waste Liquors. III. The
tions in the USSR,	W74-04821 3F	Interaction of Chloro-Oxylignin with Metal Salts (In Japanese),
W74-04426 2J	KHANDEKAR, M. L.	W74-04512 5D
KAREV, K.	Application of the Concept of Rectilinear Vor-	KONDUR, L. V.
Water Consumption and Biological Coefficient	tices to the Movement of Oil Slicks, W74-04490 5B	The Feeding of Pelecus Cultratus L. in Kairak-
of Furrow and Sprinkler Irrigated Cotton, (In	W/4-04490	kum Reservoir, (In Russian),
Bulgarian), W74-04824 3F	KIBBEL, W. H. JR.	W74-04695 2H
W14-04024	Hydrogen Peroxide for Industrial Pollution	KOROLEV, A. A.
KASPER, J.	Control, W74-04532 5D	Ozonization as a Method of Purifying Water
Production Ability of Legumes, Grasses and Their Mixtures in Hill-Land Regions,		Polluted with Chemical Composition, (In Russian).
W74-04694 4A	KILMER, R. E. Feasibility Study for a Surge-Action Model of	W74-04836 5D
WATTONIA M. C.	Monterey Harbor, California,	KORONKEVICH, N. I.
KATONA, M. G. Ice EngineeringSummary of Elastic Proper-	W74-04721 2L	Spring Runoff From Hillslopes, Small
ties Research and Introduction to Viscoelastic	KIMMEL, G. E.	Watersheds, and River Basins (Vesenniy stok
and Nonlinear Analysis of Saline Ice,	Surface- and Ground-Water Conditions During	so sklonov, malykh vodosborov, rechnykh bas- seynov),
W74-04793 2C	1959-61 in a Part of Flett Creek Basin, Tacoma,	W74-04577 2E
KAUTZMAN, R. R.	Washington,	PRAIRY N
Approaches to Stormwater Management,	W74-04796 2E	KRALEV, N. A Study on the Depth of Basic Tillage and Soil
W74-04458 5A	KIMURA, M.	Fertilization for Maize Grown Under Irrigation,
KAWASE, K.	Application of Polyacrylamide to Pulp Mill Ef-	(In Bulgarian),
Strontium-90 and Cesium-137 Levels in Soils of	fluents (In Japanese), W74-04529 5D	W74-04828 3F
Various Types at Niigata Prefecture, Japan, W74-04453 5B		KRAVKINA, I. M.
	KINGHAM, D. J.	Overgrowth of Ooze Iron-Manganese Microor- ganisms Studied by Electron Microscopy, (In
KEARNY, C. H. Trans-Pacific Fallout and Protective Counter-	Viscosity Measurements of Water in Region of Its Maximum Density,	Russian),
measures,	W74-04518 2K	W74-04558 5A
W74-04454 5B	WIND W. I. ID	KRIEGER-WOLFF, E.
KEENEY, D. R.	KIPP, K. L. JR. Radiological Status of the Groundwater	Chironomidae (Diptera) from the Area of
Paper Mill Sludge Disposal on Soils: Effects on	Beneath the Hanford Project, July-December	Freiburg in Breisgau (with Special Considera-
the Yield and Mineral Nutrition of Oats (Avena	1972,	tion of the Genus Chironomus), (In German), W74-04678
satival.),	W74-04452 5B	
W74-04519 5E	KISHI, T.	KRISHNAMURTHY, K. Nucleonic Sediment Concentration Gauge -
KEITH, J.	Transformation, Breaking and Run-Up of a	Comparison of Transmission and Scattering
Social, Economic, Environmental, and Techni- cal Factors Influencing Water Reuse.	Long Wave of Finite Height, W74-04741 2L	Modes,
W74-04317 SD	21.	W74-04774 2J
	KLIEWER, R. M.	KRUEGER, W.
KEIZER, P. D.	A General Solution for the Two-Dimensional, Transient Heat Conduction Problem in Per-	Problem of Isolating Salmonella from Surface
Laboratory Studies of the Accommodation of Some Crude and Residual Fuel Oils in Sea	mafrost, Using Implicit, Finite Difference	Waters Exemplified by Long-Term Studies in the Berlin Area, Capital of the German
Water,	Methods,	Democratic Republic, (In German),
W74-04775 5B	W74-04350 2C	W74-04835 5A

5B

KRUG, H. Influence of Soil Moisture Conditions on	LANDANYI, B. Evaluation of in Situ Creep Properties of	LEHN, H. The Relation Between Phytoplankton and Phosphate in the Lake of Constance, (In Ger-
Growth and Development of the Potato Solanum tuberosum L., W74-04687 3F	Frozen Soils with the Pressuremeter, W74-04377 2C	man), W74-04637 5C
W74-04687 3F	LANG, E. W.	W 74-04037 SC
KRUMHOLZ, L. A. A Detailed Investigation of the Sociological,	Processes for Reducing the Organic-Carbon Content of Water Contaminated with Organic	LEITHE, W. Analysis of Organic Pollutants in Water and
Economic, and Ecological Aspects of Proposed Reservoir Sites in the Salt River Basin of Ken-	Compounds by Continuous Countercurrent Multistage Treatment with Activated Carbon,	Waste Water, W74-04633 5A
tucky, W74-04310 2A	W74-04704 5D	LEONT'EV, O. K. History of the Formation of the Coasts of
KRYLOVA, N. V.	LANGE, G. R.	Kara-Bogaz-Gol,
Disposal of Radioactive Wastes, W74-04445 5D	Investigation of Sampling Perennially Frozen Alluvial Gravel by Core Drilling,	W74-04427 2J
177-0443	W74-04402 2C	LESCHACK, L. A.
KRYLOVA, Z. A. Spring Runoff From Hillslopes, Small	LANGELAND, A. Polluted Snow in Southern Norway During the	Potential Use of Airborne Dual-Channel In- frared Scanning to Detect Massive Ice in Per-
Watersheds, and River Basins (Vesenniy stok so sklonov, malykh vodosborov, rechnykh bas-	Winters 1968-1971,	mafrost, W74-04403 7B
seynov),	W74-04652 5B	LESOVSKAYA, L. V.
W74-04577 2E	LAPAGE, S. P.	Effect of the Forest on the Displacement of the
KRYUCHKOVA, N. M.	Identification of Bacteria by Computer: Theory	Desna River Bed and the Significance of this
Role of Phyto- and Zooplankton in Self-Purifi- cation Processes (Exemplified by Oxidation	and Programming, W74-04791 5A	Effect on Forest Planting in the Floodplain, (In Russian).
Ponds), (In Russian),	W/4-04/21	W74-04641 4A
W74-04692 5G	LARSEN, I.	W/4-04041
	Buoyancy Spread of Waste Water in Coastal	LEWELLEN, R. I.
KUNTE, H.	Regions,	The Occurrence and Characteristics of
Thin-Layer and Gas-Chromatographic Deter- mination of Phenols Present in Water, (In Ger-	W74-04630 5B	Nearshore Permafrost, Northern Alaska, W74-04359 2C
man),	LARSON, D. B.	I PUNC IN M ID
W74-04684 5A	Shock-Wave Studies of Ice and Two Frozen Soils,	LEWIS, W. M. JR. The Thermal Regime of Lake Lanao
KURIYAMA, M.	W74-04378 2C	(Philippines) and its Theoretical Implications
Process for Purifying Water that Contains Or-		for Tropical Lakes,
ganic Matter, W74-04716 5D	LAU, J.	W74-04665 2H
W74-04716 5D	Harmonic Generation of Shallow Water Waves	LIBOSVARSKY, J.
KUTUZOVA, R. S.	Over Topography,	Fishery Survey Carried out at Lake Borullus,
Overgrowth of Ooze Iron-Manganese Microor-	W74-04323 2E	A. R. E., in the Spring of 1971, (In Czech),
ganisms Studied by Electron Microscopy, (In	LAURENSON, E. M.	W74-04643 2H
Russian),	A Design Procedure for the Conjunctive Use of	Y WWA NI P
W74-04558 5A	Surface and Groundwater Storages,	LIHAN, E. Effect of Long-Term Application of Variously
L'VOVICH, A. 1.	W74-04598 4B	High Rates of Nutrients on Natural Grassland
Some Neglected Sources of Water Pollution	I D SAPITATION D	Swards,
(Nedostatochno uchityvayemyye istochniki	LE MEHAUTE, B.	W74-04693 4A
zagryazneniya prirodnykh vod),	On Non-Saturated Breakers and the Wave Run-	THI PUANC O. I
W74-04579 5B	Up, W74-04742 2L	LILLEVANG, O. J. Mean Direction of Waves and of Wave Energy,
LACHENBRUCH, A. H.	***************************************	W74-04328 2J
Thermal Conditions in PermafrostA Review	Shallow Water Waves: A Comparison of Theo-	
of North American Literature,	ries and Experiments,	LIN, A.
W74-04347 2C	W74-04609 2E	Shallow Water Waves: A Comparison of Theo-
LADD, C. T.	LEAN, D. R. S.	ries and Experiments, W74-04609 2E
Syracuse Metropolitan Area Comprehensive	Movements of Phosphorus Between its Biologi-	W /4-04009
Plan-Water and Sewer Plan and Services Allo-	cally Important Forms in Lake Water,	LINDH, G.
cation Plan,	W74-04783 5B	Urbanization: A Hydrological Headache,
W74-04507 5D		W74-04642 4C
LAEVASTU, T.	LEARY, R. D.	LINELL, K. A.
A Review of Oceanographic Variables and	200 MGD Activated Sludge Plant Removes Phosphorus by Pickle Liquor,	Engineering Design and Construction in Per-
Their Analyses and Predictions Over the Con-	W74-04554 5D	mafrost Regions: A Review,
tinental Shelf,		W74-04404 8D
W74-04329 2L	LEBRET, T.	Long-Term Effects of Vegetative Cover on
LAGAREC, D.	Changes in the Avifauna of the Biesbosch in	Permafrost Stability in an Area of Discontinu-
Postglacial Permafrost Features in Eastern	the 1st Yr After the Elimination of the Tide,	ous Permafrost,
Canada,	W74-04699 2I	W74-04417 4C
W74-04358 2C	LEENDERTSE, J. J.	
	A Three-Dimensional Model for Estuaries and	Risk of Uncontrolled Flow from Wells Through
LAMBOLEY, G. A.	Coastal Seas: Volume I, Principles of Compu-	Permafrost, W74-04395 2F
Anti-Pollution Barrier, W74-04705 5G	tation,	11 /4-01373
	W74-04301 2L	LINGENFELTER, R. E.
LAND, L. S.		Power Law Dependence on Time of River
Eolian Cross-Bedding in the Beach Dune En-	Use of a Computational Model for Two-Dimen-	Flood Decay and Its Relationship to Long-
vironment, Sapelo Island, Georgia, W74-04737 2J	sional Tidal Flow, W74-04631 2L	Term Discharge Frequency Distribution, W74-04806 4A
11 (4-04/3)	11 14-04031	17 / T-U10UU 4A

LIU, S. K.	MACCRIMMON, H. R.	MATHIES, J. B.
A Three-Dimensional Model for Estuaries and	Nutrients in Subsurface and Runoff Waters of	Annual Consumption of Cesium-137 and
Coastal Seas: Volume I, Principles of Compu-	the Holland Marsh, Ontario,	Cobalt-60 Labeled Pine Seeds by Small Mam-
tation,	W74-04478 5B	mals in an Oak-Hickory Forest,
W74-04301 2L	MAGNAN A B	W74-04450 5B
LIU, T. C.	MACKAY, J. R.	MATSUSHITA, G. K.
The Response to Tidal Fluctuations of a Leaky	Origin, Composition, and Structure of Perenni-	Baseline Quality Data for Kalihi Stream,
Aquifer System.	ally Frozen Ground and Ground Ice: A Review, W74-04366 2C	W74-04309 5B
W74-04308 2F	W74-04366 2C	MCDDAN C
	Problems in the Origin of Massive Icy Beds,	MCBEAN, G.
LOBACZ, E. F.	Western Arctic, Canada,	Measurements of the Turbulent Fluxes of Mo- mentum, Moisture and Sensible Heat Over the
Corps of Engineers Technology Related to	W74-04369 2C	Ocean,
Design of Pavements in Areas of Permafrost,		W74-04673 2E
W74-04414 4C	MADDOCK, T. III.	
Shear Strength at a Thaw Interface,	The Operation of a Stream-Aquifer System	MCCLELLAND, G. A. H.
W74-04390 2C	Under Stochastic Demands,	Aedes aegypti and Aedes simpsoni Breeding in
	W74-04808 4B	Coral Rock Holes on the Coast of Tanzania, W74-04697 21
LOCHER, P.	MADEYSKI, A.	W /4-0409/
Concerning Large-Scale Cultivation of Thermo-	Some Problems Involved in Optimal Protection	MCCORMICK, J. H.
philic Cosmopolitan Mastigocladus Laminousus	of the Environment in Spas,	Temperature Requirements for Embryos and
Cohn (Cyanophyta) in Icelandic Hot Springs, W74-04486 2I	W74-04847 5G	Larvae of the Northern Pike, Esox lucius
W/4-04460 21		(Linnaeus),
LOCKETT, J. B.	MAKAROVA, L. I.	W74-04670 5C
Phenomena Affecting Improvement of the	Nutrient Uptake by Winter Wheat in a Zone of	MCGINNIS, L. D.
Lower Columbia Estuary and Entrance,	Unstable Moisture, (In Russian),	Geophysical Identification of Frozen and Un-
W74-04763 2L	W74-04827 3F	frozen Ground, Antarctica,
LONGWON W. W.	MAN WARTING THE	W74-04360 2C
LONGINOV, V. V.	MALKMUS, W.	
The Determination of Maximum Wave Veloci- ties in the Shore Zone of the Sea.	Air Pollution Measurements From Satellites,	MCGUIRE, M. J.
W74-04437 2J	W74-04485 5A	Viscosity Measurements of Water in Region of
117-04-57	MALONEY, W. E.	Its Maximum Density, W74-04518 2K
The Possibility of Forecasting Transient	A Study of Diffusion in an Estuary,	W/4-04516
Coastal Relief Changes by Waves,	W74-04333 5B	MCKIM, H. L.
W74-04436 2J	W. 1 0 1333	The Unfrozen Water and the Apparent Specific
LONGUET WAS DIS NO.	MAMAYEV, O. I.	Heat Capacity of Frozen Soils,
LONGUET-HIGGINS, M. S.	Comments on Veronis' Paper, 'On Properties	W74-04374 2C
Sea Waves and Beach Cusps,	of Seawater Defined by Temperature, Salinity,	MCNAIR, E. C. JR.
W74-04734 2J	and Pressure',	Galveston Bay Hurricane Surge Study: Report
LOVRICH, J.	W74-04658 2K	2. Effects of Proposed Barriers on Tides, Cur-
Solar Distillation Apparatus,		rents, Salinities, and Dye Dispersion for Nor-
W74-04720 3A	MANOHAR, M.	mal Tide ConditionsAppendix B: Calibration
	Sediment Movement at Indian Ports,	tests,
LUDWIG, C. B.	W74-04345 2L	W74-04573 8B
Air Pollution Measurements From Satellites,	MANTHE, R. M.	MCNEIL, W. J.
W74-04485 5A	200 MGD Activated Sludge Plant Removes	Pink and Chum Salmon Culture,
LUIKOV, A. V.	Phosphorus by Pickle Liquor,	W74-04797 8I
Analytical Methods of Solution of Conjugated	W74-04554 5D	***************************************
Problems in Convective Heat Transfer,	30	MCNEILL, D.
W74-04667 8B	MARKOV, A. P.	Electromagnetic Probing of Permafrost,
	An Experiment in Sanitary-Virological	W74-04400 2C
LUNDE, G.	Research on Sewage, (In Russian),	MCVEE, C. V.
The Analysis of Arsenic in the Lipid Phase	W74-04849 5B	Permafrost Considerations in Land Use
from Marine and Limnetic Algae, W74-04557 5A	MARCHARDY D.C.	Planning Management,
W74-04557 5A	MARSZALEK, D. S.	W74-04361 2C
Analysis of Trace Elements, Phosphorus and	Scanning Electron Microscopy of Fixed,	
Sulphur, in the Lipid and the Non-Lipid Phase	Frozen, and Dried Protozoa,	MEDVEDEV, S. P.
of Halibut (Hippoglossus hippoglossus) and	W74-04497 7B	Catalytic Oxidation and Thermal Treatment of
Tunny (Thunnus thynnus),	MARTIN, J. A.	Waste Waters (Kataliticheskoe okislenie i ter- micheskoe obezvrezhivanie stochnykh vod),
W74-04770 5A	Syracuse Metropolitan Area Comprehensive	W74-04537 5D
THECUED II	Plan-Water and Sewer Plan and Services Allo-	
LUSCHER, U. Thaw Consolidation of Alaskan Silts and	cation Plan,	MEDVEDEV, V. S.
Granular Soils,	W74-04507 5D	Certain Structural and Developmental Coastal
W74-04379 2C		Features in the South of the Maritime Territo-
20	MARTIN, K. L.	ry, W74-04432 2J
LUSK, S.	Lime Disinfection of Sewage Bacteria at Low	W 14-04-32 23
Fishery Survey Carried out at Lake Borullus,	Temperature.	Some Results of Regional Coastal Investiga-
A. R. E., in the Spring of 1971, (In Czech),	W74-04548 5D	tions in the USSR,
W74-04643 2H	MASON, B. J.	W74-04426 2J
LYAKHOVA, I. G.	Bioassay Procedures to Evaluate Acute Toxici-	MELLOR, M.
Ridge-Pool Complex Formation of Khotkhur-	ty of Neutralized Bleached Kraft Pulp Mill Ef-	Mechanical Properties of Rocks at Low Tem-
sky Bog Mass (In Russian).	fluent to Pacific Salmon,	peratures,
W74-04812 3F	W74-04779 5C	W74-04380 2C

NAIR, K.

моок, Р. н.

MERCADO, A.

Economic Aspects of Ground Water Resources and Replacement Flows in Semiarid Agricul-	Screening Aerator Concentrator, W74-04712 5D	a Deep Sand Permafrost,
tural Areas,	W/4-04/12 3D	W74-04387 2C
W74-04563 4B	MOON, C. E. Nutrient Income Change Related to Plankton	NAKANO, Y.
MERNA, J. W.	Algae,	Sound and Shock Transmission in Frozen
The Effects of Methoxychlor on Aquatic Biota, W74-04553 5C	W74-04318 5C	Soils, W74-04383 2C
W 74-04333	MOREY, R. V.	
MEYER, R. E.	A Simulation Model for Evaluating Irrigation	NAKAO, K.
SURF,	Management Practices,	Geophysical Identification of Frozen and Un-
W74-04725 2J	W74-04564 3F	frozen Ground, Antarctica,
		W74-04360 2C
MILES, M. E.	MORGAN, C. W.	NAKHSHINA, E. P.
Environmental Monitoring and Disposal of	Statistical Analysis of Hydrograph Charac-	Micro- and Mesobenthos Development as a
Radioactive Wastes from U.S. Naval Nuclear-	teristics for Small Urban Watersheds,	Factor of Soil Composition (In Russian),
Powered Ships and Their Support Facilities,	W74-04459 2A	W74-04816 2H
1972,	MODGENETERN N. P.	W/4-04010 211
W74-04441 5B	MORGENSTERN, N. R.	NASONOVA, N. P.
MILLED A C	Physics, Chemistry, and Mechanics of Frozen	Utilization of Nutrients from Soil and Fertil-
MILLER, A. C.	Ground: A Review, W74-04373 2C	izers by Pasture Grass as Dependent on Soil
A Detailed Investigation of the Sociological,	W74-04373 2C	Moisture (In Russian),
Economic, and Ecological Aspects of Proposed Reservoir Sites in the Salt River Basin of Ken-	Practical Extensions to a Theory of Consolida-	W74-04820 4A
	tion for Thawing Soils,	
tucky, W74-04310 2A	W74-04384 2C	NAZIROV, N. N.
W74-04310 2A		Drought Resistance of Radiation-Induced Mu-
MILLER, R. D.	MORRISON, G. F.	tant Varieties and Parent Forms of Cotton, (In
Soil Freezing in Relation to Pore Water Pres-	An Inexpensive S.T.D. Data Logging System,	Russian),
sure and Temperature,	W74-04772 7C	W74-04822 3F
W74-04381 2C		
	MORRISON, S. M.	NEFF, S. E.
MILLER, T. W.	Lime Disinfection of Sewage Bacteria at Low	A Detailed Investigation of the Sociological,
Permafrost Protection for Pipelines,	Temperature.	Economic, and Ecological Aspects of Proposed
W74-04415 2C	W74-04548 5D	Reservoir Sites in the Salt River Basin of Ken-
	MODEL P. W.	tucky, W74-04310 2A
MIRI-LAVASANI, J.	MORSE, F. H.	W74-04310 2A
Groundwater Investigation and Management in	Potential Use of Airborne Dual-Channel In-	NELSON, D. W.
Iran,	frared Scanning to Detect Massive Ice in Per-	Phosphorus Relationships in Runoff from Fer-
W74-04569 7B	mafrost,	tilized Soils,
MIDONOVA N. W.	W74-04403 7B	W74-04471 5B
MIRONOVA, N. YA.	MOSSEL, D. A. A.	
Littoral Vegetation Overgrowing in Some	The Direct Enumeration of Escherichia coli in	NEVESSKII, E. N.
Lakes of Kalinin District, (In Russina), W74-04646 2H	Water Using Macconkey's Agar at 44 C in	Some Data on the Post-Glacial Evolution of
W74-04646 2H	Plastic Pouches,	Karkinit Bay and the Accumulation of Bottom
MISAKA, Y.	W74-04768 5A	Sediments Within it,
Process for Purifying Water that Contains Or-		W74-04429 2J
ganic Matter,	MUKAI, T.	MICHOLIC V II
W74-04716 5D	Process for Purifying Water that Contains Or-	NICHOLLS, K. H. Nutrients in Subsurface and Runoff Waters of
	ganic Matter,	the Holland Marsh, Ontario,
MIYAMOTO, S.	W74-04716 5D	W74-04478 5B
Land Disposal of Waste Gases: II. Gas Flow		W/4-044/6
from Buried Pipes,	MULKOVSKI, Y.	NICHOLSON, F. H.
W74-04480 5E	Results of Trials with Tobacco and Cotton	Permafrost and Snowcover Relationships Near
	Rotations Under Irrigation, (In Bulgarian),	Schefferville,
Land Disposal of Waste Gases: 1. Flow Analy-	W74-04825 3F	W74-04362 2C
sis of Gas Injection Systems,	MULLER, L.	
W74-04479 5E	The Use of Polyurethane Foam Plastics in the	Studies at the Timmins 4 Permafrost Experi-
MOHAMED EL-SEDFY, H.	Construction of Expedient Roads on Per-	mental Site,
Fishery Survey Carried out at Lake Borullus,	mafrost in Central Alaska,	W74-04363 2C
A. R. E., in the Spring of 1971, (In Czech),	W74-04421 8G	NIEMI, A.
W74-04643 2H	11/4-04421	Effects of Toxicants on Brackish-Water
W/4-04043 2H	MURRAY, S. P.	Phytoplankton Assimilation,
MOHANRAO, G. J.	Simulation of Horizontal Turbulent Diffusion	W74-04644 5C
Aspects of Colour Removal from Pulp and	of Particles Under Waves,	1177007
Paper Mill Effluents,	W74-04624 2J	NIXON, J. F.
W74-04514 5D		Practical Extensions to a Theory of Consolida-
	MURRMANN, R. P.	tion for Thawing Soils,
Characteristics of Pulp and Paper Mill Wastes	Ionic Mobility in Permafrost,	W74-04384 2C
and ISI Standards,	W74-04382 2C	NODA W
W74-04530 5B	MIDTY T C	NODA, H.
Law Cost Mathodo for Touris Dula and Duna	MURTY, T. S.	A Study on Mass Transport in Boundary
Low Cost Methods for Treating Pulp and Paper	Application of the Concept of Rectilinear Vor-	Layers in Standing Waves,
Mill Effluents,	tices to the Movement of Oil Slicks, W74-04490 5B	W74-04615 21
W74-04531 5D	W74-04490 5B	NOWAK, S.
MONROY, J. F.	MYER, G. E.	Apparatus for Recording Avoidance Move-
Water Pollution in the Netherlands,	A Field Study of Langmuir Circulations,	ments of Fish,
W74-04536 5B	W74-04845 2H	W74-04776 5A

O'CONNOR, B. A.	PAQUIN, J. E.	Geochemistry of Permafrost and Quaternary
Shear Velocity in a Tidal Estuary, W74-04629 2L	Measurements of the Turbulent Fluxes of Mo- mentum, Moisture and Sensible Heat Over the Ocean.	Stratigraphy, W74-04364 2C
O'REAR, D. M. Surface-Water Availability, Lauderdale Coun-	W74-04673 2E	PHELPS, G. T. Measurements of the Turbulent Fluxes of Mo-
ty, Alabama, W74-04494 2E	PAREKH, R. C. Characteristics of Pulp and Paper Mill Wastes	mentum, Moisture and Sensible Heat Over the Ocean.
OERTLE, D. H.	and ISI Standards, W74-04530 5B	W74-04673 2E
Experimental Pressure Studies on Frost Heave Mechanisms and the Growth-Fusion Behavior of Ice, W74-04385 2C	Low Cost Methods for Treating Pulp and Paper Mill Effluents, W74-04531 5D	Spectra of the Temperature and Humidity Fluc- tuations and of the Fluxes of Moisture and Sen- sible Heat in the Marine Boundary Layer, W74-04672 2E
OLAH, J.	PARKIN, D. W.	
Distribution of Organic Matter and Bacteria in the Upper Layer of Bottom Deposit of Lake	Sea Waves and Beach Cusps, W74-04734 2J	PHILIP, J. R. On Solving the Unsaturated Flow Equation: 2. Critique of Parlange's Method.
Balaton, W74-04839 5B	PAVIA, E. H.	W74-04492 2G
OLARU, M.	Hypochlorination of Polluted Storm-Water Pumpage at New Orleans,	PIERSON, W. J. JR. The Elevation, Slope, and Curvature Spectra of
Syngnathus nigrolineatus nigrolineatus (Eichwald) in the Frasinet River and Mostistea	W74-04676 5D	a Wind Roughened Sea Surface, W74-04476 2E
Lake, (In Rumanian), W74-04700 2I	PAVLIDIS, YU. A. Recent Development of the Temryuk Coast on	PILKEY, O. H.
OLIAN, A.	the Azov Sea, W74-04430 2J	Beach Profiles of a Georgia Barrier Island,
Application of Dynamic Programming in Mar- kov Chains to the Evaluation of Water Quality	PAYLORE, P.	W74-04736 2J
in Irrigation,	World Desertification: Cause and Effect. A Literature Review and Annotated Bibliography.	PINNER, G. F. Sedimentation Tanks,
W74-04561 3C	W74-04461 3B	W74-04708 5D
OLINDO, P. M. A Preliminary Survey of the Possible Con-	PELINOVSKIY, Y. M.	PIPER, R. M.
tamination of Lake Nakuru in Kenya with Some Metals and Chlorinated Hydrocarbon	Propagation of a Finite-Amplitude Surface Wave With Allowance for Random Irregulari- ties of the Bottom,	What's Wrong with Government Water Control Programs and how They can be Improved, W74-04632 5D
Pesticides, W74-04547 5C	W74-04841 2J	POBEDIMSKIY, A. D.
OLSEN, J. O.	PENNINGS, J. H.	Water Quality Improvement in River Basins
Floating Breakwater Pontoon, W74-04711 8B	A Preliminary Survey of the Possible Con- tamination of Lake Nakuru in Kenya with Some Metals and Chlorinated Hydrocarbon	(Experience of Industrialized Countires) (O povyshenii kachestva vody v rechnykh bas- seynakh (Opyt industrial'nykh stran)),
OLSON, K. R. Mercury Uptake and Ion Distribution in Gills	Pesticides, W74-04547 5C	W74-04583 50
of Rainbow Trout (Salmo gairdneri): Tissue	PENROSE, R. G. JR.	POLLITZER, S.
Scans with an Electron Microprobe, W74-04778 5A	Laboratory Study of Self-Sealing Limestone Plugs for Mine Openings,	Willamette Cleanup, W74-04522 5E
OLTMAN, B. G.	W74-04559 5G	POND, S.
A Radiological Environmental Survey at EBR- II,	PERA, L.	Measurements of the Turbulent Fluxes of Mo mentum, Moisture and Sensible Heat Over the
W74-04455 5B	On the Stability of Laminar Plumes: Some Nu- merical Solutions and Experiments,	Ocean, W74-04673 2F
OSIECK, E. R. A Find of Marsh Sandpiper Tringa stagnatilis in	W74-04662 5B	Spectra of the Temperature and Humidity Fluc
the Netherlands, W74-04681 5C	PERHAM, R. E. An Analytical Study of a Coiled-Pipe Heat	tuations and of the Fluxes of Moisture and Sen sible Heat in the Marine Boundary Layer,
OUTCALT, YS. I.	Sink, W74-04589 8B	W74-04672 2E
A Simulation Sensitivity Analysis of the Needle Ice Growth Environment.	PETR, T.	PONTIUS, U. R.
W74-04370 2C	Benthic Fauna of a Tropical Man-Made Lake (Volta Lake, Ghana 1965-1968),	Hypochlorination of Polluted Storm-Water Pumpage at New Orleans,
PALAMARCHUK, I. K. Micro- and Mesobenthos Development as a	W74-04636 2H	W74-04676 51
Factor of Soil Composition (In Russian), W74-04816 2H	PETROVA, N. A. Determination of Microgram Quantities of Polyethylene Polyamines in Water, (In Rus-	PONYI, J. E. Distribution of Organic Matter and Bacteria in the Upper Layer of Bottom Deposit of Lake
PALANGE, R. C.	sian),	Balaton, W74-04839 51
An Assessment of the Use of Potomac Estuary Waters and AWT Effluents for Emergency	W74-04701 5A	
Water Supply, W74-04506 5D	PETTIBONE, H. C. Stability of an Underground Room in Frozen	POPIVANOV, I. Results of Trials with Tobacco and Cotto
PANTIN, H. M.	Gravel, W74-04418 2C	Rotations Under Irrigation, (In Bulgarian), W74-04825
Sedimentation in Hawke Bay,		POPOV, B. A.
W74-04726 2L PANUZIO, F. L.	PEWE, T. L. Distribution of Permafrost in North America and Its Relationship to the Environment: A	The Effect of Wave Refraction on the Formation of an Equilibrium Profile of Submarin
The Atlantic Coast of Long Island,	Review, 1963-1973,	Coastal Slope,

POWELL, R. S.

POWELL, R. S. 200 MGD Activated Sludge Plant Removes	The Fallacy of Baer's Law or Coriolis' Effect on the Meandering of Rivers,	Neotropical Region (Southeast Pampasic Region of Argentina), (In Spanish),
Phosphorus by Pickle Liquor, W74-04554 5D	W74-04799 8B	W74-04817 2H
POWER, L. D.	The Problem of Critical Discharge in Sediment Motion.	ROCHESTER, E. W. Soil Crusting Related to Sprinkler Intensity,
Permafrost Protection for Pipelines, W74-04415 2C	W74-04801 2J	W74-04560 3F
POWERS, W. H. JR.	RADD, F. J. Experimental Pressure Studies on Frost Heave	RODE, A. A.
Waves at Camp Pendleton, California, W74-04607 2E	Mechanisms and the Growth-Fusion Behavior of Ice,	Water Conditions in Soils of the Bogar Zone of the Uzbek SSR, W74-04809 2G
	W74-04385 2C	W /4-04809 20
PRATISHTHANANDA, S. Social, Economic, Environmental, and Technical Factors Influencing Water Reuse, W74-04317 5D	RADZIUL, J. V. Mathematical Modeling for Status Prediction and Control of Water Distribution Systems,	RODIONOV, V. S. Potential Intensity of Photosynthesis in Some Tomato and Beet Species Under Different Soil
PRICE, L. W.	W74-04320 4A	Moisture, (In Russian), W74-04691 3F
Rates of Mass Wasting in the Ruby Range,	RAISTAKKA, J. E.	DOMESTIC M. I. M.
Yukon Territory, W74-04371 2J	Conduit Structure for Migrating Fish, W74-04715 8I	ROMKENS, M. J. M. Phosphorus Relationships in Runoff from Fer- tilized Soils,
PRICE, V. S.	DATACODAL AN B	W74-04471 5B
State Environmental Management, Case Stu- dies of Nine States,	RAJAGOPALAN, R. Nucleonic Sediment Concentration Gauge - Comparison of Transmission and Scattering	ROSELAAR, C. S.
W74-04503 5G	Modes,	A Find of Marsh Sandpiper Tringa stagnatilis in the Netherlands,
PRICE, W. A.	W74-04774 2J	W74-04681 5C
Variable Dispersion and Its Effects on the Movements of Tracers on Beaches, W74-04618 2J	RALEIGH, C. W. Hydrogen Peroxide for Industrial Pollution	ROSKOPF, R. F.
-	Control, W74-04532 5D	Trickling Filter-Activated Sludge Combinations for Domestic Wastewater Treatment,
PRITCHARD, D. W. Estuaries,		W74-04798 5D
W74-04321 2L	RAMOS, G. Quantity and Chemical Quality of Low Flow in	ROUTSON, R. C.
PRIVAL'SKIY, V. YE. Water Level Fluctuations of the Caspian Sea	the East Fork San Jacinto and West Fork San Jacinto Rivers near Houston, Texas, June 24,	One-Dimensional Model of the Movement of Trace Radioactive Solute Through Soil
(K probleme urovennogo rezhima Kaspiyskogo morya),	26, 1969, W74-04481 5B	Columns: The Percol Model, W74-04444 5B
W74-04575 2H	RAO, S. M.	ROWLEY, R. K.
PROKOPENKO, N. I. Effect of Fertilizers and Irrigation Conditions	Nucleonic Sediment Concentration Gauge - Comparison of Transmission and Scattering Modes.	Effects of Ground-Ice Variability and Resulting Thaw Settlements on Buried Warm-Oil Pipelines,
on Yield, Chemical Composition, Baking Quali- ties of Winter Wheat Grain of Bezostaya 1 Cul- tivar, (In Russian),	W74-04774 2J	W74-04422 4C
W74-04830 3F	RATKOVICH, D. YA. Water Level Fluctuations of the Caspian Sea	Performance of a Warm-Oil Pipeline Buried in Permafrost,
PROKOPOWICH, J. Eutrophication of Lake 227 by Addition of	(K probleme urovennogo rezhima Kaspiyskogo morya),	W74-04423 8D
Phosphate and Nitrate: The Second, Third, and	W74-04575 2H	ROY, N.
Fourth Years of Enrichment, 1970, 1971, and 1972,	RATTRAY, M. JR.	Effect of Entrance on Seiche Motion in Ocean Ports,
W74-04789 5C	New Dimensions in Estuary Classification,	W74-04743 2L
PROUSE, N. J.	W74-04735 2L	ROZHDESTVENSKIY, G. D.
Laboratory Studies of the Accommodation of	REED, S. C.	Mudflows (Selevyye potoki),
Some Crude and Residual Fuel Oils in Sea Water,	A Sewage-Treatment Concept for Permafrost Areas,	W74-04581 4D
W74-04775 5B	W74-04419 5D	RUDD, J. W. M.
PURPURA, J. A. Application of Fluorescent Coated Sand in Lit-	REEDER, H. A. Statistical Analysis of Hydrograph Charac-	Measurement of Adenosine Triphosphate (ATP) in Two Precambrian Shield Lakes of
toral Drift and Inlet Studies, W74-04616 2L	teristics for Small Urban Watersheds, W74-04459 2A	Northwestern Ontario, W74-04782 SE
PURTYMUN, W. H.	RICHTER, D. M.	RUSSELL, C. R.
Ecodistribution of Plutonium in Liquid Waste Disposal Areas at Los Alamos,	Beach Profiles of a Georgia Barrier Island, W74-04736 2J	Mercury Removal from Waste Water with Starch Xanthate-Cationic Polymer Complex, W74-04541 5D
W74-04443 5B	RICKEY, W. P.	
QUINN, W. F. An Analytical Study of a Coiled-Pipe Heat Sink,	Permafrost Protection for Pipelines, W74-04415 2C	RUSSELL, R. C. H. Similarity in Sediment Transport Due to Waves.
W74-04589 8B	RUTEMA, P. E.	W74-04755 2.
OURAISHY, M. S.	Water Withdrawal by Plant Roots, W74-04655 3F	RUTTER, N. W.
The Calculation of Critical Discharge Velocity		A Geoecological Terrain Analysis of Discon-
of Streams in Uniform Flow and the Trans- ported Sediment Size,	RINGUELET, R. A. Ecology and Biocoenology of Lagunas or	tinuously Frozen Ground in the Upper Macken zie River Valley, Canada,
W74-04800 2J	Lakes of Third Order of the Temperate	W74-04354 20

RYAN, N. G.	SCHAPER, W.	SEAGER, S. L.
Potential Use of Airborne Dual-Channel In-	Modern Waste Water Treatment and	Environmental Chemistry: Air and Water Pol-
frared Scanning to Detect Massive Ice in Per- mafrost,	Processing Techniques in the Paper and Board Industry (Moderne Abwasseraufbereitungs-und	lution, W74-04513 5B
W74-04403 7B	Verfahrenstechnik in der Papier- und Kartonin-	SEGUY, L.
RYAN, R. B.	dustrie),	Rainfed Rice in Southern Senegal: Evaluation
Potential Use of Airborne Dual-Channel In-	W74-04517 5D	of Three Years' Experimentation (1966-1969),
frared Scanning to Detect Massive Ice in Per-	SCHERER, E.	(In French),
mafrost,	Apparatus for Recording Avoidance Move-	W74-04829 3F
W74-04403 7B	ments of Fish,	SEITZ, H. R.
SACHAN, P. C.	W74-04776 5A	Suspended and Bedload Sediment Transport in
Aspects of Colour Removal from Pulp and	SCHERFIG, J.	the Snake and Clearwater Rivers in the Vicinity
Paper Mill Effluents,	Effect of Phosphorus Removal Processes on	of Lewiston, Idaho,
W74-04514 5D	Algal Growth,	W74-04846 2J
SAGER, R. A.	W74-04552 5C	SEKI, H.
Galveston Bay Hurricane Surge Study: Report		Ecological Characteristics of Go-No-Ike Lake,
2. Effects of Proposed Barriers on Tides, Cur-	SCHINDLER, D. W.	W74-04638 5C
rents, Salinities, and Dye Dispersion for Nor-	Diurnal Variation of Dissolved Inorganic Car- bon and its Use in Estimating Primary Produc-	SELLMANN, P. V.
mal Tide ConditionsAppendix B: Calibration	tion and CO2 Invasion in Lake 227,	Geochemistry of Permafrost and Quaternary
tests,	W74-04784 5A	Stratigraphy,
W74-04573 8B		W74-04364 2C
SAKUMA, M.	Eutrophication of Lake 227 by Addition of	
Application of Polyacrylamide to Pulp Mill Ef-	Phosphate and Nitrate: The Second, Third, and	Stratigraphy and Diagenesis of Perennially
fluents (In Japanese),	Fourth Years of Enrichment, 1970, 1971, and	Frozen Sediments in the Barrow, Alaska, Re- gion,
W74-04529 5D	1972,	W74-04365 2C
SALVAMON C S	W74-04789 5C	1177000
SALYAMON, G. S.	Production of Epilithiphyton in Two Lakes of	SERNE, R. J.
Determination of Microgram Quantities of Polyethylene Polyamines in Water, (In Rus-	the Experimental Lakes Area, Northwestern	One-Dimensional Model of the Movement of
sian),	Ontario,	Trace Radioactive Solute Through Soil
W74-04701 5A	W74-04787 5C	Columns: The Percol Model, W74-04444 5B
	CONTAINS B V	W/4-0444
SAMESHIMA, K.	SCHMIDT, R. V. Eutrophication of Lake 227 by Addition of	SEUNG, IL CHOI
Color of Pulp Industry Waste Liquors. III. The	Phosphate and Nitrate: The Second, Third, and	The Need of Geological Investigations for the
Interaction of Chloro-Oxylignin with Metal Salts (In Japanese),	Fourth Years of Enrichment, 1970, 1971, and	Development of the Ground Water Resources
W74-04512 5D	1972,	of the Republic of Korea,
W/+04512	W74-04789 5C	W74-04466 4B
SANTOS, C.		SHADRIN, I. F.
Prediction of the 1972 Managua, Nicaragua,	Production of Epilithiphyton in Two Lakes of	The Possibility of Predicting Longshore Cur-
Earthquake from Groundwater Changes, In-	the Experimental Lakes Area, Northwestern	rents in Tideless Seas,
ferred Probability of Earthquakes in the City of Managua, Nicaragua, during the Summer of	Ontario, W74-04787 5C	W74-04439 2J
1973,	W/4-04/6/	SHAFFER, F. B.
W74-04467 2F	SCHNEIDER, G.	Characteristics of Streamflow at Gaging Sta-
	Annual Consumption of Cesium-137 and	tions in the Loup River Basin, Nebraska,
SAPIK, D. B.	Cobalt-60 Labeled Pine Seeds by Small Mam-	W74-04794 2E
Reconnaissance of the Ground-Water	mals in an Oak-Hickory Forest,	SHAGA, N. I.
Resources of Cimarron County, Oklahoma, W74-04495 4B	W74-04450 5B	Some New Data Concerning Zizania latifolia
117-04-55	SCHUBERT, C.	(Grisob.) STAPF AND ITS Resources in the
SATO, S.	Striated Ground, A Type of Patterned Ground	Flood Plains of Lower Amur,
A Study of Critical Depth and Mode of Sand	in the Periglacial Area of the Venezuelan	W74-04703 21
Movement Using Radioactive Glass Sand,	Andes, (In Spanish),	SHAGA, V. S.
W74-04752 2J	W74-04651 2G	Some New Data Concerning Zizania latifolia
SAUVAGE DE SAINT MARC, G.	SCHUBERT, G.	(Grisob.) STAPF AND ITS Resources in the
Shore Transport. Formation of Sand Spits and	Power Law Dependence on Time of River	Flood Plains of Lower Amur,
Tombolos,	Flood Decay and Its Relationship to Long-	W74-04703 2I
W74-04722 2J	Term Discharge Frequency Distribution,	CHAROCHNIKOVA I M
SAVILLE, T. JR.	W74-04806 4A	SHAPOSHNIKOVA, I. M. Nutrient Uptake by Winter Wheat in a Zone of
An Approximation of the Wave Run-Up	SCHIBMANN C	Unstable Moisture, (In Russian),
Frequency Distribution,	SCHURMANN, G. Influences of Soil Density, Clay Silt and	W74-04827 3F
W74-04740 2L	Humus Content on Measurements of Soil	CHABAROV V A
SAYLES, F. H.	Water by Neutron Gauges, (In German),	SHARAPOV, V. A. Reservoirs of Europe and Some Aspects of
Triaxial and Creep Tests on Frozen Ottawa	W74-04556 2G	Their Construction and Multipurpose Use
Sand,		(Vodokhranilishcha zarubezhnoy Yevropy i
W74-04386 2C	SCHWENDIMAN, L. C.	nekotoryye voprosy ikh sozdaniya i komplek-
	Environmental Surveillance for Fuel Fabrica-	snogo ispol'zovaniya),
SAYLOR, J. H.	tion Plants,	W74-04582 8A
Currents at Harbor Beach, Michigan,	W74-04451 5B	SHCHERBAKOV, F. A.
W74-04342 5B	SCHWOYER, W. L.	Certain Structural and Developmental Coastal
Modification of Nearshore Currents by Coastal	Gravity Dewatering: Application to Paper Mill	Features in the South of the Maritime Territo-
Structures,	Wastes,	ry,
W74-04341 8B	W74-04533 5D	W74-04432 2J

SHCHERBAKOV, F. A.

Some Data on the Post-Glacial Transgression	SMALL, E. B.	SPARHAM, V.
of the Bering Sea,	Scanning Electron Microscopy of Fixed,	Sedimentation Tanks,
W74-04431 2J	Frozen, and Dried Protozoa,	W74-04708 5D
SHEIKH, KHALID HAMID	W74-04497 7B	SPEER, T. L.
Effects of Flooding and Draining and Their Al-	SMALLEY, I. J.	Effects of Ground-Ice Variability and Resulting
ternation on the Growth and Uptake of	Quickclays as Products of Glacial Action: A	Thaw Settlements on Buried Warm-Oil
Nutrients by Rice (Oryza Sativa L., Indica Var.	New Approach to Their Nature, Geology, Dis-	Pipelines,
IR-8),	tribution and Geotechnical Properties, W74-04590 2G	W74-04422 4C
W74-04826 3F	W 74-04390 20	CHIPCUN V I
SHEPHERD, J. A.	SMILES, D. E.	SPITSYN, V. I. Disposal of Radioactive Wastes,
Hydrogen Peroxide for Industrial Pollution	Measurement of Moisture Diffusivity of Wet	W74-04445 5D
Control,	Swelling Systems,	17 T T T T T T T T T T T T T T T T T T T
W74-04532 5D	W74-04493 2G	SPYRIDAKIS, D.
SHERBROOKE, W. C.	SMIRNOVA-GARAEVA, N. V.	Nutrient Income Change Related to Plankton
World Desertification: Cause and Effect. A	Coastal-Water Vegetation of the Lower	Algae,
Literature Review and Annotated Bibliography,	Reaches of the Dnestr (In Russian),	W74-04318 5C
W74-04461 3B	W74-04813 2L	STACY, R. A.
CHERNAN P. C.	SMITH, B. S. L.	The Elevation, Slope, and Curvature Spectra of
SHERMAN, R. G. A Groundwater Supply for an Oil Camp Near	A Refraction Study and Program for Periodic	a Wind Roughened Sea Surface,
Prudhoe Bay, Arctic Alaska,	Waves Approaching a Shoreline, and Extend-	W74-04476 2E
W74-04396 2F	ing Beyond the Breaking Point,	
-	W74-04340 8B	STANLEY, L. E.
SHIGANOVA, V. L.	SMITH, D. K.	Control of Culvert Icing,
Salmonella Serotypes in Sewage of Various	A Report on the Limnology of Monroe Reser-	W74-04411 4C
Origins,	voir, Indiana,	STARKE, R. A.
W74-04850 5B	W74-04792 2H	Water Purification,
SHUMAY, C. R.	Charmer of t	W74-04706 5F
Allocation of Scarce Resources to Agricultural	SMITH, G. L. Modeling of Turbulent Transport in the Surface	
Research: Review of Methodology,	Layer,	STEPANOVA, G. A.
W74-04566 3F	W74-04795 2D	Parasite Fauna of Ctenopharyngodon idella
		from Pond- and Spawning-Nursery Fisheries in
SHUYAK, B. A.	SMITH, L. D.	the Volga Delta, (In Russian),
Certain Aspects of the Interaction Between Wave Flow and a Deformable Bottom at Low	Sociocultural Impact of Reservoirs on Local	W74-04702 8I
Velocities.	Government Institutions, Anthropological	STEVENS, H. W.
W74-04435 2J	Analysis of Social and Cultural Benefits and Costs from Stream Control MeasuresPhase 4,	Viscoelastic Properties of Frozen Soil Under
1171 01133	W74-04311 6B	Vibratory Loads,
SINCLAIR, W. C.		W74-04388 8D
Hydrogeologic Characteristics of the Surficial	SMITH, M. W.	
Aquifer in Northwest Hillsborough County,	Thermal Disturbance Due to Channel Shifting,	STEWART, J. W.
Florida,	Mackenzie Delta, N.W.T., Canada,	Hydrologic and Geologic Considerations for
W74-04468 2F	W74-04351 2C	Solid-Waste Disposal in West-Central Florida,
SINGH, K. Y.	SMITH, N.	W74-04605 5E
Waves Off Benghazi Harbour - Libya,	Encountering Massive Ground Ice During Road	STEWART, K. M.
W74-04608 2L	Construction in Central Alaska,	Detailed Time Variations in Mean Temperature
CHEMIC A.	W74-04420 4C	and Heat Content of Some Madison Lakes,
SITTIG, M.	The Use of Polyurethane Foam Plastics in the	W74-04659 2H
Pollutant Removal Handbook, W74-04527 5D	Construction of Expedient Roads on Per-	
W/4-0432/ 5D	mafrost in Central Alaska,	STEWART, R. W.
SJOBERG, S.	W74-04421 8G	Measurements of the Turbulent Fluxes of Mo-
The Use of Computer Simulations for Systems	CMITTI D E	mentum, Moisture and Sensible Heat Over the
Ecological Studies in the Baltic,	SMITH, R. E. Sample Disturbance and Thaw Consolidation of	Ocean, W74-04673 2E
W74-04634 5B	a Deep Sand Permafrost,	1174 01075
SJOBLOM, G. L.	W74-04387 2C	STOKER, H. S.
Environmental Monitoring and Disposal of		Environmental Chemistry: Air and Water Pol-
Radioactive Wastes from U.S. Naval Nuclear-	SMITH, W. S.	lution,
Powered Ships and Their Support Facilities,	Sample Disturbance and Thaw Consolidation of	W74-04513 5B
1972,	a Deep Sand Permafrost, W74-04387 2C	STRASH, A. M.
W74-04441 5B	W/4-0450/	A Radiological Environmental Survey at EBR-
SVAAD C	SONU, C.	II.
SKAAR, C. Water in Wood,	Rhythmic Pattern of Longshore Bars Related to	W74-04455 5B
W74-04545 2I	Sediment Characteristics,	
21	W74-04750 2J	STRAUSS, S. D.
SLAUGHTER, C. W.	SONU, C. J.	Industry Awaits Solutions to Problems of High-
Recharge of a Central Alaska Lake by Subper-	Collective Movement of Sediment in Littoral	Level Radioactive-Waste Management,
mafrost Groundwater,	Environment,	W74-04457 5D
W74-04394 2F	W74-04621 2J	STREET, R. L.
SLUSARCHUK, W. A.	SORENSEN, T.	The Effects of Bottom Configuration on the
Performance of a Warm-Oil Pipeline Buried in	Buoyancy Spread of Waste Water in Coastal	Deformation, Breaking and Run-Up of Solitary
Permafrost,	Regions,	Waves,
W74-04423 8D	W74-04630 5B	W74-04613 2E

TANEY, N. E.

STUIVER, M.

TICE, A. R.

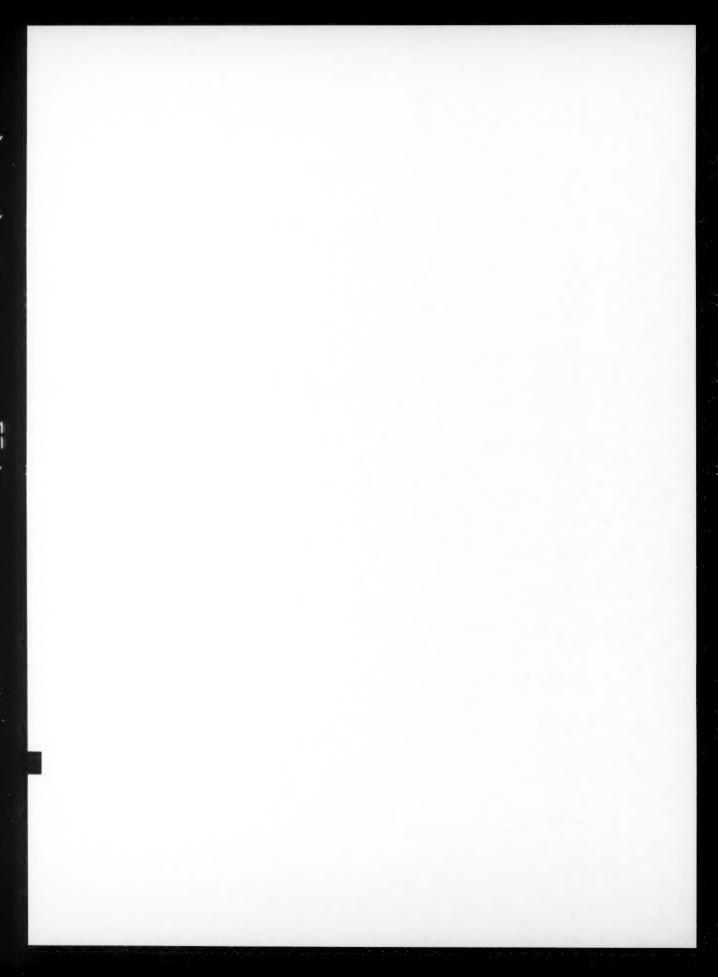
Application of Fluorescent Coated Sand in Lit-	Laboratory Applications of Radioisotopic	The Unfrozen Water and the Apparent Specific
toral Drift and Inlet Studies, W74-04616 2L	Tracers to Follow Beach Sediments, W74-04751 2J	Heat Capacity of Frozen Soils, W74-04374 2C
W74-04616 2L	W/4-04/31 2J	
SUBRAHMANYAM, P. V. R.	TARASOVA, E. N.	TIMPE, W. G.
Aspects of Colour Removal from Pulp and	Ratio of Organic Carbon with Different Types	Processes for Reducing the Organic-Carbon Content of Water Contaminated with Organic
Paper Mill Effluents,	of Oxidizability in the Open Water of Baikal (In	Compounds by Continuous Countercurrent
W74-04514 5D	Russian),	Multistage Treatment with Activated Carbon,
Characteristics of Pulp and Paper Mill Wastes	W74-04819 5C	W74-04704 5D
and ISI Standards,	TARVERDIEVA, M. I.	THOE B C
W74-04530 5B	Daily Diet and Rate of Feeding of Notothenia	TJIOE, P. S. A Preliminary Survey of the Possible Con-
	rossi marmorata Fischer and Dissostichus elegi-	tamination of Lake Nakuru in Kenya with
Low Cost Methods for Treating Pulp and Paper	noides Smitt, Family Notothenidae, in the Area	Some Metals and Chlorinated Hydrocarbon
Mill Effluents,	of Southern Georgia (USSR), (In Russian),	Pesticides,
W74-04531 5D	W74-04679 2I	W74-04547 5C
SUESS, A.	TASHMATOV, N. T.	TOMKA, O.
Influences of Soil Density, Clay Silt and	Drought Resistance of Radiation-Induced Mu-	Effect of Long-Term Application of Variously
Humus Content on Measurements of Soil	tant Varieties and Parent Forms of Cotton, (In	High Rates of Nutrients on Natural Grassland
Water by Neutron Gauges, (In German),	Russian),	Swards,
W74-04556 2G	W74-04822 3F	W74-04693 4A
SULLIVAN, R. H.	TAY A O	TORPEY, W. N.
Survey of Facilities Using Land Application of	TAY, A. O.	Method and Apparatus for the Biological Treat-
Wastewater,	Application of the Finite Element Method to Convection Heat Transfer Between Parallel	ment of Waste Water,
W74-04677 5D	Planes,	W74-04709 5D
	W74-04765 8B	
SUMIMOTO, M.		TRPIS, M. Aedes aegypti and Aedes simpsoni Breeding in
Color of Pulp Industry Waste Liquors. III. The	TAYLOR, J. R.	Coral Rock Holes on the Coast of Tanzania,
Interaction of Chloro-Oxylignin with Metal Salts (In Japanese),	Shock-Wave Studies of Ice and Two Frozen	W74-04697 2I
W74-04512 5D	Soils,	
W/+04512 3D	W74-04378 2C	TURNER, A. B.
SUNDAR, A.	TAYLOR, T. P.	Apparatus for Treating Industrial and Domestic
Complete Listing of Program Described in Op-	Permafrost Protection for Pipelines,	Waste Waters, W74-04707 5D
timal Operation of Multi-Reservoir Water	W74-04415 2C	W /4-04/0/
Resources Systems,	W/40413	TUTHILL, S. J.
W74-04315 4A	TEESDALE, C.	Hydrogeologic Considerations in Solid Waste
Optimal Operation of Multi-Reservoir Water	Aedes aegypti and Aedes simpsoni Breeding in	Storage in Iowa: Part 1. Sanitary Landfill Site
Resources Systems,	Coral Rock Holes on the Coast of Tanzania,	Selection: Part 2. A Method of Hazardous and
W74-04314 4A	W74-04697 2I	Toxic Waste Disposal, W74-04592 5E
CUTTURED LAND II D	THOM, B. G.	11 14 04 572
SUTHERLAND, H. B. Pore Water and Heaving Pressures Developed	Studies at the Timmins 4 Permafrost Experi-	UGOLINI, F. C.
in Partially Frozen Soils,	mental Site,	Soil Development and Patterned Ground
W74-04389 2C	W74-04363 2C	Evolution in Beacon Valley Antarctica, W74-04372 2G
		W /4-043/2 20
SWANSON, C. L.	THOMPSON, B. M.	UNGER, S. G.
Mercury Removal from Waste Water with	Heterotrophic Utilization of Sucrose in an Ar-	State-of-Art Review: Water Pollution Control
Starch Xanthate-Cationic Polymer Complex,	tificially Enriched Lake, W74-04781 5C	Benefits and Costs, Vol I,
W74-04541 5D	W/4-04/61	W74-04464 5G
SYLVESTER, J. R.	THOMPSON, W. C.	VAGALE, L.
Effect of Light on Vulnerability of Heat-	The Effect of Waves on the Profile of a Natu-	The Rajasthan Canal Area: A Settlement Struc-
Stressed Sockeye Salmon to Predation by Coho	ral Beach,	ture,
Salmon,	W74-04620 2J	W74-04499 6D
W74-04671 5C	THOMSON, S.	VAN EVERDINGEN, R. O.
TAKAHASHI, M.	Shear Strength at a Thaw Interface,	Groundwater Investigations in Permafrost Re-
Ecological Characteristics of Go-No-Ike Lake,	W74-04390 2C	gions of North America: A Review,
W74-04638 5C		W74-04391 2F
	THORNTON, E. B.	VASSILEV, A.
TAKAHASHI, O.	A Field Investigation of Sand Transport in the	Comparative Testing of Short-Term Wheat
Application of Polyacrylamide to Pulp Mill Ef-	Surf Zone,	Monoculture, (In Bulgarian),
fluents (In Japanese),	W74-04619 2J	W74-04831 3F
W74-04529 5D	THUM, A. B.	VALIDREY V D
TANAKA, N.	Inshore Sea Surface Temperature and Salinity	VAUDREY, K. D. Ice EngineeringSummary of Elastic Proper-
A Study of Critical Depth and Mode of Sand	Conditions at Agate Beach, Yaquina Bay and	ties Research and Introduction to Viscoelastic
Movement Using Radioactive Glass Sand,	Whale Cove, Oregon, in 1970,	and Nonlinear Analysis of Saline Ice,
W74-04752 2J	W74-04730 2L	W74-04793 2C
MANAKA B	TIDBY D D	
TANAKA, R.	TIBBY, R. B. Multi-Dimensional Aspects of Eddy Diffusion	VEATCH, F. M. Surface- and Ground-Water Conditions During
A Study on the Accuracy of Runoff Analysis for Pumping Drainage in Paddy Field Area (In	Determined by Dve Diffusion Experiments in	1959-61 in a Part of Flett Creek Basin, Tacoma,
Japanese),	Coastal Waters (Summary),	Washington,
W74-04811 4A	W74-04322 2L	W74-04796 2E

VEGA, C. L.

VEGA, C. L.	WARNKE, D. A.	WIESE, W.
The Direct Enumeration of Escherichia coli in	Drastic Beach Changes in a Low-Energy En-	Influence of Soil Moisture Conditions on
Water Using Macconkey's Agar at 44 C in	vironment Caused by Hurricane Betsy.	Growth and Development of the Potato
Plastic Pouches,	W74-04756 2J	Solanum tuberosum L.,
W74-04768 5A		W74-04687 3F
11777700	WARRICK, A. W.	
VIERECK, L. A.	Land Disposal of Waste Gases: II. Gas Flow	WILLCOX, W. R.
Ecological Effects of River Flooding and	from Buried Pipes,	Identification of Bacteria by Computer: Theory
Forest Fires on Permafrost in the Taiga of	W74-04480 5E	and Programming,
Alaska,	Land Disposal of Waste Gases: 1 Flow Apply	W74-04791 5A
W74-04352 2C	Land Disposal of Waste Gases: 1. Flow Analysis of Gas Injection Systems,	WILLIAMS I A
TITLICATE C	W74-04479 SE	WILLIAMS, J. A. The Response to Tidal Fluctuations of a Leaky
VINCENT, G.	W/T-OTT/)	Aquifer System,
Shore Transport. Formation of Sand Spits and	WATSON, G. H.	W74-04308 2F
Tombolos,	Effects of Ground-Ice Variability and Resulting	W 74-04506
W74-04722 2J	Thaw Settlements on Buried Warm-Oil	WILLIAMS, J. R.
VINOGRADOV, B. V.	Pipelines,	Groundwater Investigations in Permafrost Re-
Determination of Soil Moisture by Remote	W74-04422 4C	gions of North America: A Review,
Sensing Techniques (Opredeleniye vlazhnosti	Post	W74-04391 2F
pochyy distantsionnymi aerokosmicheskimi	Performance of a Warm-Oil Pipeline Buried in	
metodami),	Permafrost,	WILLIS, C. E.
W74-04576 2G	W74-04423 8D	Flood Proofing Decisions Under Uncertainty:
	WATTS, G. M.	An Application to the Connecticut River Basin,
VISSER, G. A.	Mechanical Bypassing of Littoral Drift at In-	W74-04463 6A
Floating Breakwater Pontoon,	lets,	WILLMON, J. R.
W74-04711 8B	W74-04337 2L	Surface-Water Availability, Lauderdale Coun-
		ty, Alabama,
VISWANATHAN, R.	WEBER, W. J. JR.	W74-04494 2E
Thermal Responses in Cirrhina mrigala Fry,	Physicochemical Processes for Water Quality	W 74-04124
W74-04661 5C	Control,	WILSON, B. W.
	W74-04546 5D	Feasibility Study for a Surge-Action Model of
VLACHOS, E.	THE TOTAL OF THE	Monterey Harbor, California,
Managing Growth in a Fragile Environment:	WEISS, S. F.	W74-04721 2L
Problems of the Rocky Mountain States,	Multipurpose Reservoirs and Urban Develop-	
W74-04505 6D	ment,	Hurricane Tide Prediction for New York Bay,
WARDON A T	W74-04319 6B	W74-04343 2L
VLADIMIROV, A. T.	WELCH, E. B.	Color Energy for the Concentration of Duly Mills
Morphology and Evolution of aLagoon Coast	Nutrient Income Change Related to Plankton	Solar Energy for the Concentration of Pulp Mill
on Sakhalin,	Algae,	Effluents, W74-04544 5D
W74-04433 2J	W74-04318 5C	W74-04544 5D
VOLGIN, M. V.	W/4 04010	WILSON, G. E.
Sex Cycle, Spawning and Fertility of West	WENGERT, N.	Method of Treating Sewage Using High
	What Do We Mean by Metropolitan Water	Polymer Ratio Flocculation Agent Biologically
Siberian Crucians in the Steppe Lakes, (In Rus-	Management Institutions.,	Produced in Situ,
sian), W74-04689 2H	W74-04498 6E	W74-04717 5D
W74-04689 2H		W/4-04/17
WAHLSTROM, P.	WESTFALL, T. R.	WILSON, K. V.
The Use of Computer Simulations for Systems	Screening Aerator Concentrator,	Hydraulic Performance of BridgesExcava-
Ecological Studies in the Baltic,	W74-04712 5D	tions at Bridges,
W74-04634 5B	WHALIN, R. W.	W74-04482 8B
	Study of Beach Widening By the Perched	
WAITE, D. A.	Beach Concept, Santa Monica Bay, California,	WILSON, W. S.
Environmental Surveillance for Fuel Fabrica-	W74-04603 8B	Field Measurements of Swell Off the Island of
tion Plants,	W/4-04003	Aruba,
W74-04451 5B	WHITE, F. A.	W74-04723 2E
	Mass Spectrometry and Inhomogeneous Ion	WING, R. E.
WALDEN, C. C.	Optics,	Mercury Removal from Waste Water with
Effects of Condensates on the Toxicity of	W74-04475 5A	Starch Xanthate-Cationic Polymer Complex,
Kraft Pulp Mill Effluents,		W74-04541 5E
W74-04521 5D	WHITFIELD, M. S. JR.	W/4-04541 3L
SECAR SCORE OF V	Availability of Ground Water in the Winnsboro	WINGET, C. L.
WALKER, H. J.	Area, Louisiana,	A Bacteriological Pressure-Retaining Deep-Sea
The Nature of the Seawater-Freshwater Inter-	W74-04596 4B	Sampler and Culture Vessel,
face During Breakup in the Colville River	WIEGEL, R. L.	W74-04773 5A
Delta, Alaska,		
W74-04397 2C	Mixing Processes, W74-04327 5B	WINTERBERG, F.
WALLACE, C. R.	W 14-04321 3B	Electric Cloud and Weather Modification with
Effects of Temperature on Developing Meristic	Shores and Shore Processes,	Intense Relativistic Electron Beams,
Structures of Smallmouth Bass, Micropterus	W74-04339 2L	W74-04604 3E
dolomieui Lacepede,		WIDEEN C O
W74-04663 5C	The Solitary Wave,	WIRSEN, C. O.
30	W74-04326 8B	A Bacteriological Pressure-Retaining Deep-Sea
WARFORD, J. J.	Wayer Committed by Wardenstal Mark	Sampler and Culture Vessel,
Land Value Increments as a Measure of the	Waves Generated by Horizontal Motion of a	W74-04773 5A
Net Benefits of Urban Water Supply Projects	Wall, W74-04760 8B	WOMACK, J. D.
in Developing Countries: Theory and Measure-	W74-04760 8B	Remote Sensing in Sampling Site Location in
ment,	Waves in Shoaling Water,	Lakes and Streams,
W74-04502 6B	W74-04338 8B	W74-04313 5A
OD.		

WU, J.	ZEH
Physical and Dynamical Scales for Generation	A
of Wind Waves, W74-04330 2E	Si
WUELKER, W. Chironomidae (Diptera) from the Area of	ZHI
Chironomidae (Diptera) from the Area of Freiburg in Breisgau (with Special Considera-	(1
tion of the Genus Chironomus), (In German),	m
W74-04678 2H	W
WULFF, F.	ZH
The Use of Computer Simulations for Systems	P
Ecological Studies in the Baltic, W74-04634 5B	D R
	V
YALIN, S.	ZIN
Similarity in Sediment Transport Due to Waves.	A
W74-04755 2J	V
YAMAGUCH, Y.	V
Ecological Characteristics of Go-No-Ike Lake,	ZIY
W74-04638 5C	A
YARON, D.	ti
Application of Dynamic Programming in Mar-	k
kov Chains to the Evaluation of Water Quality	0
in Irrigation, W74-04561 3C	V
	ZO
YEN, Y. C. An Analytical Study of a Coiled-Pipe Heat	,
Sink,	Ŋ
W74-04589 8B	
YOKOYAMA, E.	ZS
Strontium-90 and Cesium-137 Levels in Soils of	t
Various Types at Niigata Prefecture, Japan,	V
W74-04453 5B	ZU
YOUNG, G. K.	(
An Assessment of the Use of Potomac Estuary	P
Waters and AWT Effluents for Emergency Water Supply,	(
W74-04506 5D	,
YOUNG, J. C.	
Trickling Filter-Activated Sludge Combinations	
for Domestic Wastewater Treatment,	
W74-04798 5D	
YOUNG, R. H. F.	
Baseline Quality Data for Kalihi Stream, W74-04309 5B	
YUEN, A. F. H.	
A Laboratory Investigation of Free Surface Flows Over Wavy Beds,	
W74-04477 8B	
ZADOKS, J. C.	
Relations Between Soil Water Potential and	
Disease in Wheat Seedlings Infected by Puc-	
cinia recondita, W74-04653 3F	
W/4-04633	
ZAGORENKO, G. F.	
Subglacial Development of Chlorella in Baikal, (In Russian).	
W74-04647 2H	
ZAKHAROWA, K. P.	
Disposal of Radioactive Wastes,	
W74-04445 5D	
ZAKHIDOV, A. Z.	
Application of Regression Analysis to Estima-	
tion of the Efficiency of Water Use in Irriga-	
tion (Opyt primeneniya regressionnogo analiza k otsenke effektivnosti ispol'zovaniya vody pri	
oroshenii),	
W74-04580 3F	

W74-04589 ZHDANOVA, I. S. Water Level Fluctuations of the (K probleme urovennogo rezhima	8B
Water Level Fluctuations of the (K probleme urovennogo rezhima	
(K probleme urovennogo rezhima	
morva).	Kaspiyskogo
W74-04575	2H
ZHUPANENKO, R. P.	
Phytoplankton Dynamics in th	e Severskiy
Donets River for the First Yes	ers After its
Regulation, (In Russina),	
W74-04648	5C
ZIMMERMAN, C. J.	
A Report on the Limnology of M	onroe Reser-
voir, Indiana,	
W74-04792	2H
ZIYAKHODZHAYEV, M. Z.	
Application of Regression Analys	
tion of the Efficiency of Water I	
tion (Opyt primeneniya regression k otsenke effektivnosti ispol'zova	
oroshenii),	mya vody pr
W74-04580	3F
ZOCIDZE B C	
ZOSIDZE, R. S. Vertical Distribution of Zoober	thee of the
Mountain River of Adzhar ASSR	
W74-04818	2
2001 NATI	
ZSOLNAY, A. Hydrocarbon and Chlorophyll: A	Correlation is
the Upwelling Region off West Af	
W74-04771	5E
ZUBER, H.	
Concerning Large-Scale Cultivation	n of Thermo
philic Cosmopolitan Mastigocladus	
Cohn (Cyanophyta) in Icelandic H	ot Springs,
W74-04486	21



ORGANIZATIONAL INDEX

CARRESTA D C D DICHARDECT (DIMANUA)	and a distriction of a substitution	ALACKA CTATE DEBT OF PANIBONMENTAL
ACADEMIA R. S. R., BUCHAREST (RUMANIA).	pochvy distantsionnymi aerokosmicheskimi metodami),	ALASKA STATE DEPT. OF ENVIRONMENTAL CONSERVATION, FAIRBANKS.
INSTITUTUL DE BIOLOGIE. Types of Distribution Pattern Among Fresh-	W74-04576 2G	Water Supply and Waste Disposal Concepts
water Animals, (In Rumanian),		Applicable in Permafrost Regions,
W74-04840 2I	Spring Runoff From Hillslopes, Small	W74-04405 5D
A CARDON OF A CREATE WINA A COUNTY OF	Watersheds, and River Basins (Vesenniy stok	
ACADEMY OF AGRICULTURAL SCIENCES,	so sklonov, malykh vodosborov, rechnykh bas-	ALASKA STATE DEPT. OF HIGHWAYS,
CHIRPAN (BULGARIA). INST. OF COTTON. A Study on the Depth of Basic Tillage and Soil	seynov),	COLLEGE. Control of Permafrost Degradation Beneath a
Fertilization for Maize Grown Under Irrigation,	W74-04577 2E	Roadway by Subgrade Insulation,
(In Bulgarian),	Littoral Vegetation Overgrowing in Some	W74-04409 4C
W74-04828 3F	Lakes of Kalinin District, (In Russina),	***************************************
	W74-04646 2H	ALASKA UNIV., COLLEGE.
ACADEMY OF AGRICULTURAL SCIENCES,		Groundwater Pore Pressures Adjacent to Sub-
KHASKOVO (BULGARIA). COMPLEX EXPERIMENTAL STATION.	AKADEMIYA NAUK SSSR, MOSCOW.	arctic Streams,
Water Consumption and Biological Coefficient	INSTITUT VODNYKH PROBLEM.	W74-04393 2C
of Furrow and Sprinkler Irrigated Cotton, (In	Water Level Fluctuations of the Caspian Sea	Recharge of a Central Alaska Lake by Subper-
Bulgarian),	(K probleme urovennogo rezhima Kaspiyskogo	mafrost Groundwater,
W74-04824 3F	morya), W74-04575 2H	W74-04394 2F
ACADEMY OF AGRICULTURAL SCIENCES,	W14-04373	ALACKA UNIV COLLECT INCT OF WATER
TOLBUKHIN (BULGARIA). INST. OF WHEAT	Mudflows (Selevyye potoki),	ALASKA UNIV., COLLEGE. INST. OF WATER RESOURCES.
AND SUNFLOWERS.	W74-04581 4D	Hydrology of the Central Arctic River Basins
Productivity and Grain Qualities of Certain		of Alaska,
Newly Developed Native and Foreign Wheat	Reservoirs of Europe and Some Aspects of	W74-04304 2A
Varieties Grown Under Irrigation, (In Bulgari-	Their Construction and Multipurpose Use	
an),	(Vodokhranilishcha zarubezhnoy Yevropy i	ALBERTA UNIV., EDMONTON.
W74-04832 3F	nekotoryye voprosy ikh sozdaniya i komplek-	A Spatial Correlation Between Plant Distribu-
ACADEMY OF AGRICULTURE SCIENCES,	snogo ispol'zovaniya),	tion and Unfrozen Ground Within a Region of
KARNOBAT (BULGARIA). COMPLEX	W74-04582 8A	Discontinuous Permafrost, W74-04355 2C
RESEARCH INST. OF AGRICULTURE.	AKADEMIYA NAUK SSSR, NOVOSIBIRSK,	W 14-04333
Comparative Testing of Short-Term Wheat	The Phytoplankton Productivity in the Pyasina	Practical Extensions to a Theory of Consolida-
Monoculture, (In Bulgarian),	River Near Tareva Village (Western Taimyr),	tion for Thawing Soils,
W74-04831 3F	(In Russian),	W74-04384 2C
AGENCY FOR INTERNATIONAL	W74-04698 2I	Shear Strength at a Thaw Interface,
DEVELOPMENT, WASHINGTON, D.C. OFFICE		W74-04390 2C
OF THE WAR ON HUNGER.	AKADEMIYA NAUK SSSR, NOVOSIBIRSK.	W 14-04370 2C
Community Water Supply.	INSTITUT BIOLOGII.	ALL-UNION RESEARCH INST. OF MARINE
W74-04510 4B	Sex Cycle, Spawning and Fertility of West Siberian Crucians in the Steppe Lakes, (In Rus-	FISHERIES AND OCEANOGRAPHY, MOSCOW
	sian),	(USSR).
AGRICULTURAL RESEARCH SERVICE,	W74-04689 2H	Daily Diet and Rate of Feeding of Notothenia
LAFAYETTE, IND. Phosphorus Relationships in Runoff from Fer-		rossi marmorata Fischer and Dissostichus elegi- noides Smitt, Family Notothenidae, in the Area
tilized Soils,	AKADEMIYA NAUK SSSR, PETROZAVODSK.	of Southern Georgia (USSR), (In Russian),
W74-04471 5B	INST. OF BIOLOGY.	W74-04679 21
	Potential Intensity of Photosynthesis in Some	
AGRICULTURAL RESEARCH SERVICE,	Tomato and Beet Species Under Different Soil	AMERICAN PUBLIC WORKS ASSOCIATION,
PEORIA, ILL. NORTHERN REGIONAL	Moisture, (In Russian), W74-04691 3F	CHICAGO, ILL.
RESEARCH LAB. Mercury Removal from Waste Water with	W/4-04091 3F	Survey of Facilities Using Land Application of
Starch Xanthate-Cationic Polymer Complex,	AKADEMIYA NAUK TADZHIKSKOI SSR,	Wastewater, W74-04677 5D
W74-04541 5D	DUSHANBE. INSTITUT ZOOLOGII I	W/4-040//
	PARAZITOLOGII.	AMSTERDAM UNIV. (NETHERLANDS). INST.
AGRICULTURAL RESEARCH SERVICE,	The Feeding of Pelecus Cultratus L. in Kairak-	OF TAXONOMIC ZOOLOGY.
UNIVERSITY PARK, PA. NORTHEAST	kum Reservoir, (In Russian),	A Find of Marsh Sandpiper Tringa stagnatilis in
WATERSHED RESEARCH CENTER.	W74-04695 2H	the Netherlands,
Soluble Phosphate Output of an Agricultural Watershed in Pennsylvania,	AKADEMIYA NAUK URSR, KIEV. INSTYTUT	W74-04681 5C
W74-04804 5B	HIDROBIOLOGII.	ARIZONA STATE UNIV., TEMPE.
	Micro- and Mesobenthos Development as a	Geochemistry of Permafrost and Quaternary
AKADEMIYA NAUK AZERBAIDZHANSKOI	Factor of Soil Composition (In Russian),	Stratigraphy,
SSR, BAKU. INSTITUT ZOOLOGII.	W74-04816 2H	W74-04364 2C
Role of Soil Conditions in the Development of		Vertical Distribution of Eishes Polative to
Moths, (In Russian), W74-04640 3F	AKADEMIYA NAUK UZBEKSKOI SSR,	Vertical Distribution of Fishes Relative to Physical, Chemical and Biological Features in
17 - O-10-10 SF	TASHKENT. INST. OF EXPERIMENTAL	Two Central Arizona Reservoirs,
AKADEMIYA NAUK SSSR, LENINGRAD.	PLANT BIOLOGY.	W74-04474 5C
INSTITUT OZEROVEDENIYA.	Drought Resistance of Radiation-Induced Mu-	
Overgrowth of Ooze Iron-Manganese Microor-	tant Varieties and Parent Forms of Cotton, (In Russian),	ARIZONA UNIV., TUCSON. DEPT. OF SOILS,
ganisms Studied by Electron Microscopy, (In	W74-04822 3F	WATER AND ENGINEERING.
Russian), W74-04558 5A		Land Disposal of Waste Gases: 1. Flow Analysis of Gas Injection Systems.
W74-04558 5A	AKADEMIYA NAVUK BSSR, MINSK. INST. OF	w74-04479 5E
AKADEMIYA NAUK SSSR, MOSCOW.	HEAT AND MASS TRANSFER.	
INSTITUT GEOGRAFII.	Analytical Methods of Solution of Conjugated	Land Disposal of Waste Gases: II. Gas Flow
Determination of Cail Maisture by Domete		, p : 1 p:
Determination of Soil Moisture by Remote Sensing Techniques (Opredeleniye vlazhnosti	Problems in Convective Heat Transfer, W74-04667 8B	from Buried Pipes, W74-04480 5E

ARIZONA UNIV., TUCSON, OFFICE OF ARID LAND STUDIES

ARIZONA UNIV., TUCSON. OFFICE OF ARID LANDS STUDIES. Southwestern Groundwater Law: A Textual	Environmental Surveillance for Fuel Fabrica- tion Plants, W74-04451 5B	BROWN AND ROOT, INC., HOUSTON, TEX. A General Solution for the Two-Dimensional,
and Bibliographic Interpretation, W74-04460 4B	Radiological Status of the Groundwater	Transient Heat Conduction Problem in Per- mafrost, Using Implicit, Finite Difference Methods.
World Desertification: Cause and Effect. A	Beneath the Hanford Project, July-December 1972,	W74-04350 2C
Literature Review and Annotated Bibliography, W74-04461 3B	W74-04452 5B	BUCKMAN LABS., INC., MEMPHIS, TENN. Water Reuse and Deposits Control,
ARKANSAS UNIV., FAYETTEVILLE. WATER RESOURCES RESEARCH CENTER.	BEDFORD INST., DARTMOUTH (NOVA SCOTIA). Laboratory Studies of the Accommodation of	W74-04520 SD
Mathematical Modeling of Stream Storage Potential,	Some Crude and Residual Fuel Oils in Sea Water,	BUREAU OF LAND MANAGEMENT, ANCHORAGE, ALASKA. Permafrost Considerations in Land Use
W74-04305 2E ARMY COASTAL ENGINEERING RESEARCH	W74-04775 5B	Planning Management,
CENTER, WASHINGTON, D.C. Waves Generated by Horizontal Motion of a	BELORUSSIAN STATE UNIV., MINSK (USSR). Role of Phyto- and Zooplankton in Self-Purification Processes (Exemplified by Oxidation	W74-04361 2C BUREAU OF MINES, SPOKANE, WASH.
Wall, W74-04760 8B	Ponds), (In Russian), W74-04692 5G	Stability of an Underground Room in Frozer Gravel,
ARMY ENGINEER DISTRICT, NEW YORK.	BHABHA ATOMIC RESEARCH CENTRE,	W74-04418 20
The Atlantic Coast of Long Island, W74-04626 8A	BOMBAY (INDIA). HEALTH PHYSICS DIV. Thermal Responses in Cirrhina mrigala Fry,	CALIFORNIA UNIV., BERKELEY. COLL. OF ENGINEERING.
ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS.	W74-04661 5C	The Analysis of Harbor and Estuary Systems, W74-04745 21
Study of Beach Widening By the Perched Beach Concept, Santa Monica Bay, California,	BHABHA ATOMIC RESEARCH CENTRE, BOMBAY (INDIA), ISOTOPE DIV. Nucleonic Sediment Concentration Gauge -	Tracing Coastal Sediment Movement by Natu
W74-04603 8B	Comparison of Transmission and Scattering Modes.	rally Radioactive Minerals, W74-04753
ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MISS.	W74-04774 2J	CALIFORNIA UNIV., DAVIS. DEPT. OF
HYDRAULICS LAB. Galveston Bay Hurricane Surge Study: Report 2. Effects of Proposed Barriers on Tides, Cur-	BIOLOGO-GEOGRAFICHESKII NAUCHNO- ISSLEDOVATELSKII INSTITUT, IRKUTSK	WATER SCIENCE AND ENGINEERING. Changes in Enzymes in the Plant as Related to Water Supply and Usage,
rents, Salinities, and Dye Dispersion for Nor- mal Tide Conditions-Appendix B: Calibration	(USSR). Ridge-Pool Complex Formation of Khotkhur-	W74-04306 2
tests, W74-04573 8B	sky Bog Mass (In Russian), W74-04812 3F	CALIFORNIA UNIV., DAVIS. LAB. OF PLANT- WATER RELATIONS.
Wave Action and Breakwater Design, Hamlin	BIRLA INST. OF TECH., RANCHI (INDIA). DEPT. OF CIVIL ENGINEERING.	Plant Responses to Water Stress, W74-04539 2
Beach Harbor, New York, W74-04588 8B	Sediment Movement at Indian Ports, W74-04345 2L	CALIFORNIA UNIV., IRVINE.
AUBURN UNIV., ALA. DEPT. OF	BRITISH COLUMBIA UNIV., VANCOUVER.	Effect of Phosphorus Removal Processes of Algal Growth,
AGRICULTURAL ENGINEERING. Soil Crusting Related to Sprinkler Intensity, W74-04560 3F	Origin, Composition, and Structure of Perennially Frozen Ground and Ground Ice: A Review,	W74-04552 56
AUBURN UNIV., ALA. DEPT. OF CIVIL	W74-04366 2C	CALIFORNIA UNIV., LIVERMORE. Shock-Wave Studies of Ice and Two Frozen
ENGINEERING. Color Removal from Textile Dye Waste by	Problems in the Origin of Massive Icy Beds, Western Arctic, Canada,	Soils, W74-04378 20
Coagulation, W74-04303 5D	W74-04369 2C BRITISH COLUMBIA UNIV., VANCOUVER.	CALIFORNIA UNIV., LOS ANGELES. DEPT.
AUSTRALIAN NATIONAL UNIV., CANBERRA. RESEARCH SCHOOL OF PHYSICAL	INST. OF OCEANOGRAPHY. Measurements of the Turbulent Fluxes of Mo-	OF PLANETARY AND SPACE SCIENCE. Power Law Dependence on Time of Rive Flood Decay and Its Relationship to Long
SCIENCES. On Solving the Unsaturated Flow Equation: 2.	mentum, Moisture and Sensible Heat Over the Ocean, W74-04673 2E	Term Discharge Frequency Distribution, W74-04806
Critique of Parlange's Method. W74-04492 2G	W74-04673 2E BRITISH WEDGE WIRE CO. LTD.,	CALIFORNIA UNIV., SAN DIEGO, LA JOLLA.
AUTOTROL CORP., MILWAUKEE. WIS. BIO- SYSTEMS DIV. (ASSIGNEE).	WARRINGTON (ENGLAND), (ASSIGNEE). Sedimentation Tanks,	INST. OF GEOPHYSICS AND PLANETARY PHYSICS. Waves at Camp Pendleton, California.
Method and Apparatus for the Biological Treat- ment of Waste Water,	W74-04708 5D BROCK UNIV., ST. CATHARINES (ONTARIO).	W74-04607 21
W74-04709 5D	DEPT. OF GEOLOGICAL SCIENCES.	CARLETON UNIV., OTTAWA (ONTARIO).
B.C. RESEARCH LTD., VANCOUVER. Effects of Condensates on the Toxicity of Kraft Pulp Mill Effluents,	The Effect of Collecting Time and Grain Size on the Sampling of Stream Sediments for Geochemical Mapping in the St. Catharines	Thermal Disturbance Due to Channel Shifting Mackenzie Delta, N.W.T., Canada, W74-04351
W74-04521 5D	Area, Ontario, W74-04587 2J	CENTRAAL INSTITUUT VOOR
BATTELLE-PACIFIC NORTHWEST LABS., RICHLAND, WASH.	BROOKINGS INSTITUTION, WASHINGTON,	VOEDINGSONDERZOEK TNO, ZEIST (NETHERLANDS).
One-Dimensional Model of the Movement of Trace Radioactive Solute Through Soil	D.C. Cost-Benefit Analysis of Irrigation Projects in	The Direct Enumeration of Escherichia coli i Water Using Macconkey's Agar at 44 C i
Columns: The Percol Model, W74-04444 5B	Northeastern Brazil, W74-04565 3F	Plastic Pouches, W74-04768 5.

CONSTRUCTION ENGINEERING INST., WARSAW (POLAND).

CENTRAL ALABAMA REGIONAL PLANNING	Physics, Chemistry, and Mechanics of Frozen	An Analytical Study of a Coiled-Pipe Heat
AND DEVELOPMENT COMMISSION,	Ground: A Review,	Sink, W74-04589 8B
MONTGOMERY. Prattville, Alabama Community Development	W74-04373 2C	W /4-04389 8B
Plan, Vol. II: Summary and Illustrations.	The Unfrozen Water and the Apparent Specific	The Water Balance in Arctic and Subarctic Re-
W74-04508 5D	Heat Capacity of Frozen Soils,	gionsAnnotated Bibliography and Preliminary
CENTRAL INST. FOR INDUSTRIAL	W74-04374 2C	Assessment, W74-04601 2C
RESEARCH, OSLO (NORWAY).	Mechanical Properties of Frozen Ground	
The Analysis of Arsenic in the Lipid Phase	Under High Pressure,	Effects of Salt Concentration Changes During
from Marine and Limnetic Algae,	W74-04375 2C	Freezing on the Unfrozen Water Content of Porous Materials,
W74-04557 5A	Mechanical Properties of Rocks at Low Tem-	W74-04802 2C
Analysis of Trace Elements, Phosphorus and	peratures,	
Sulphur, in the Lipid and the Non-Lipid Phase	W74-04380 2C	Water Flow Through Snow Overlying an Im- permeable Boundary,
of Halibut (Hippoglossus hippoglossus) and Tunny (Thunnus thynnus).	Ionic Mobility in Permafrost,	W74-04803 2C
W74-04770 5A	W74-04382 2C	
		COLORADO STATE UNIV., FORT COLLINS. What Do We Mean by Metropolitan Water
CENTRAL PUBLIC HEALTH ENGINEERING RESEARCH INST., NAGPUR (INDIA).	Sound and Shock Transmission in Frozen	Management Institutions.
Aspects of Colour Removal from Pulp and	Soils, W74-04383 2C	W74-04498 6E
Paper Mill Effluents,		Managing Growth in a Fragile Environment:
W74-04514 5D	Triaxial and Creep Tests on Frozen Ottawa	Problems of the Rocky Mountain States,
Characteristics of Pulp and Paper Mill Wastes	Sand, W74-04386 2C	W74-04505 6D
and ISI Standards,	W /4-04380 2C	
W74-04530 5B	Viscoelastic Properties of Frozen Soil Under	COLORADO STATE UNIV., FORT COLLINS. DEPT. OF CIVIL ENGINEERING.
Low Cost Methods for Treating Pulp and Paper	Vibratory Loads,	Allocation of Funding for Wastewater Treat-
Mill Effluents,	W74-04388 8D	ment Facilities,
W74-04531 5D	Risk of Uncontrolled Flow from Wells Through	W74-04562 5D
CENTRAL PUBLIC HEALTH LAB., LONDON	Permafrost,	COLORADO STATE UNIV., FORT COLLINS.
(ENGLAND). NATIONAL COLLECTION OF	W74-04395 2F	DEPT. OF MICROBIOLOGY.
TYPE CULTURES.	Electromagnetic Probing of Permafrost,	Lime Disinfection of Sewage Bacteria at Low
Identification of Bacteria by Computer: Theory	W74-04400 2C	Temperature.
and Programming, W74-04791 5A		W74-04548 5D
W/4-04/91	Investigation of Sampling Perennially Frozen	COLORADO UNIV., BOULDER.
CENTRAL TREATY ORGANIZATION,	Alluvial Gravel by Core Drilling, W74-04402 2C	Permafrost and Its Relationship to Other En-
ANKARA (TURKEY).	11/1-04-02	vironmental Parameters in a Midlatitude, High-
Cento Seminar on the Application of Remote Sensors in the Determination of natural	Engineering Design and Construction in Per-	Altitude Setting, Front Range, Colorado Rocky
Resources.	mafrost Regions: A Review, W74-04404 8D	Mountains, W74-04357 2C
W74-04567 7B	W74-04404 8D	
CENTRE NATIONAL DE RECHERCHES	Some Passive Methods of Controlling	COMMONWEALTH SCIENTIFIC AND
AGRONOMIQUES DE BAMBEY (SENEGAL).	Geocryological Conditions in Roadway Con-	INDUSTRIAL RESEARCH ORGANIZATION, CANBERRA (AUSTRALIA). DIV. OF
Rainfed Rice in Southern Senegal: Evaluation	struction, W74-04406 2C	ENVIRONMENTAL MECHANICS.
of Three Years' Experimentation (1966-1969),	W /4-04406 2C	Measurement of Moisture Diffusivity of Wet
(In French), W74-04829 3F	Environmental Considerations for the Utiliza-	Swelling Systems,
111101025	tion of Permafrost Terrain,	W74-04493 2G
CESKOSLOVENSKA AKADEMIE VED, BRNO.	W74-04407 2C	COMMONWEALTH SCIENTIFIC AND
USTAV PRO VYZKUM OBRATLOVCU. Fishery Survey Carried out at Lake Borullus,	Settlement Associated with the Thawing of Per-	INDUSTRIAL RESEARCH ORGANIZATION,
A. R. E., in the Spring of 1971, (In Czech),	mafrost,	CANBERRA (AUSTRALIA). DIV. OF LAND
W74-04643 2H	W74-04408 2C	RESEARCH. Linear Systems Technique Applied to
CESKOSLOVENSKA AKADEMIE VED.	Thermal Regime in an Arctic Earthfill Dam,	Hydrologic Data Analysis and Instrument
PRAGUE. HYDROBIOLOGICKA LAB.	W74-04410 8D	Evaluation: A Case Study on Data from the
Relation Between the Amount of Net	Control of Culuant Jair -	Alice Springs Area,
Zooplankton and the Depth of Station in Shal-	Control of Culvert Icing, W74-04411 4C	W74-04470 2A
low Lipno Reservoir, W74-04680 5C	W/4-0411	COMMONWEALTH SCIENTIFIC AND
W74-04680 5C	Long-Term Effects of Vegetative Cover on	INDUSTRIAL RESEARCH ORGANIZATION,
Horizontal Distribution of Some Chemical and	Permafrost Stability in an Area of Discontinu-	MELBOURNE (AUSTRALIA). DIV. OF CHEMICAL ENGINEERING.
Physical Characteristics in Lipno Reservoir, W74-04814 5C	ous Permafrost, W74-04417 4C	Solar Energy for the Concentration of Pulp Mill
W74-04814 5C		Effluents,
COLD REGION RESEARCH AND	A Sewage-Treatment Concept for Permafrost	W74-04544 5D
ENGINEERING LAB., HANOVER, N.H.	Areas, W74-04419 5D	CONNECTICUT UNIV., STORRS.
Effects of Stratigraphic Layers on Water Flow Through Snow,	W/4-04415	Growth of Patterned Ground in Victoria Land,
W74-04572 2C	Encountering Massive Ground Ice During Road	Antarctica,
	Construction in Central Alaska,	W74-04367 2C
COLD REGIONS RESEARCH AND ENGINEERING LAB., HANOVER, N.H.	W74-04420 4C	CONSTRUCTION ENGINEERING INST.,
Stratigraphy and Diagenesis of Perennially	The Use of Polyurethane Foam Plastics in the	WARSAW (POLAND).
Frozen Sediments in the Barrow, Alaska, Re-	Construction of Expedient Roads on Per-	Wave Effect on the Coast Formation and Ero-
gion, W74.04365	mafrost in Central Alaska, W74-04421 8G	sion, W74-04335

CONTINENTAL OIL CO., PONCA CITY, OKLA.

CONTINENTAL OIL CO., PONCA CITY,	OF PLANNING AND ARCHITECTURE.	TRANSPORTATION CO., SILVER SPRING,
OKLA. Experimental Pressure Studies on Frost Heave	The Rajasthan Canal Area: A Settlement Struc-	MD.
Mechanisms and the Growth-Fusion Behavior	ture,	Potential Use of Airborne Dual-Channel In-
of Ice,	W74-04499 6D	frared Scanning to Detect Massive Ice in Per-
W74-04385 2C		mafrost,
CORNELL UNIV ITHACA NV	DEPARTMENT OF ENERGY, MINES AND	W74-04403 7B
CORNELL UNIV., ITHACA, N.Y. Soil Freezing in Relation to Pore Water Pres-	RESOURCES, BURLINGTON (ONTARIO).	DEVELOPMENT PLANNING AND RESEARCH
sure and Temperature,	CANADA CENTER FOR INLAND WATERS. Movements of Phosphorus Between its Biologi-	ASSOCIATES, INC., MANHATTAN, KAN.
W74-04381 2C	cally Important Forms in Lake Water,	Research Needs and Priorities: Water Pollution
	W74-04783 5B	Control Benefits and Costs, Vol. II, W74-04465 5G
CORNELL UNIV., ITHACA, N.Y. DEPT. OF		W74-04465 5G
MECHANICAL ENGINEERING. On the Stability of Laminar Plumes: Some Nu-	DEPARTMENT OF ENERGY, MINES AND	DEVELOPMENT PLANNING AND RESEARCH
merical Solutions and Experiments,	RESOURCES, OTTAWA (ONTARIO). EARTH	ASSOCIATES, INC., MANHATTAN, KANS.
W74-04662 5B	PHYSICS BRANCH. Deep Temperature Observations in the Canadi-	State-of-Art Review: Water Pollution Control
	an North,	Benefits and Costs, Vol I, W74-04464 5G
CORPS OF ENGINEERS, ANCHORAGE,	W74-04349 2C	W /4-04404 3G
ALASKA.		DORNBUSCH (DAVID M.) AND CO., INC., SAN
Analysis of the Proposed Little Chena River,	DEPARTMENT OF HOUSING AND URBAN	FRANCISCO, CALIF.
Earthfilled Nonretention Dam, Fairbanks, Alaska,	DEVELOPMENT, WASHINGTON, D.C.	Benefit of Water Pollution Control on Property
W74-04412 8D	Housing and Planning References.	Values, W74-04550 5G
	W74-04511 3D	W74-04550 5G
CORPS OF ENGINEERS, PORTLAND, OREG.	DEPARTMENT OF LANDS AND FORESTS,	DUBOIS AND KING, INC., RANDOLPH, VT.
SPECIAL PROJECTS INVESTIGATION	MAPLE (ONTARIO). RESEARCH BRANCH.	Effects of Permafrost on Stream Flow Charac-
SECTION. Phenomena Affecting Improvement of the	The Preferred Temperature of Fish and Their	teristics in the Discontinuous Permafrost Zone
Lower Columbia Estuary and Entrance,	Midsummer Distribution in Temperate Lakes	of Central Alaska, W74-04392 2C
W74-04763 2L	and Streams,	W74-04392 2C
	W74-04666 5C	ECOLE POLYTECHNIQUE, MONTREAL
CORPS OF ENGINEERS, WASHINGTON, D.C.		(QUEBEC).
Corps of Engineers Technology Related to	DEPARTMENT OF SCIENTIFIC AND	Evaluation of in Situ Creep Properties of
Design of Pavements in Areas of Permafrost,	INDUSTRIAL RESEARCH, WELLINGTON	Frozen Soils with the Pressuremeter,
W74-04414 4C	(NEW ZEALAND). OCEANOGRAPHIC INST. Sedimentation in Hawke Bay,	W74-04377 2C
CORPS OF ENGINEERS, WASHINGTON, D.C.	W74-04726 2L	EG AND G, INC., LAS VEGAS, NEV.
BEACH EROSION BOARD.	11/1-04/20	Aerial Radiological Measuring Survey of the
Mechanical Bypassing of Littoral Drift at In-	Studies of a Southern Fiord.	Area Surrounding the Robert Emmett Ginna
lets,	W74-04727 2J	Nuclear Power Plant, Ontario, New York,
W74-04337 2L		Sept. 8, 1970.
Ways Foresesting Polytianshing for the Gulf of	DEPARTMENT OF THE ENVIRONMENT,	W74-04446 5A
Wave Forecasting Relationships for the Gulf of Mexico.	EDMONTON (ALBERTA).	Aerial Radiological Measuring Survey of the
W74-04729 2E	A Geoecological Terrain Analysis of Discon-	Area Surrounding the La Crosse Boiling Water
	tinuously Frozen Ground in the Upper Macken- zie River Valley, Canada,	Reactor, Genoa, Wisconsin, July 1968.
An Approximation of the Wave Run-Up	W74-04354 2C	W74-04447 5A
Frequency Distribution,		Aerial Radiological Measuring Survey of the
W74-04740 2L	DEPARTMENT OF THE ENVIRONMENT,	Area Surrounding the Vermont Yankee
Laboratory Applications of Radioisotopic	OTTAWA (ONTARIO). INLAND WATERS	Generating Station and the Yankee Nuclear
Tracers to Follow Beach Sediments,	DIRECTORATE.	Power Station, September 18, 1970.
W74-04751 2J	Viscosity Measurements of Water in Region of	W74-04448 5A
	Its Maximum Density, W74-04518 2K	Aerial Radiological Measuring Survey of the
COUNCIL ON ENVIRONMENTAL QUALITY,	W/4-04516	Area Surrounding the Point Beach Nuclear
WASHINGTON, D.C. Environmental Quality, The Fourth Annual Re-	Radio Depth-Sounding on Meighen and Barnes	Plant, Two Creeks, Wisconsin, August 16 and
port of the Council on Environmental Quality.	Ice Caps, Arctic Canada,	17, 1970.
W74-04504 SG	W74-04571 2C	W74-04449 5A
11/4-04304	DER A DESCRIPTION OF THE PARTY	EIDGENOESSISCHE TECHNISCHE
DALHOUSIE UNIV., HALIFAX (NOVA	DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). MARINE SCIENCES	HOCHSCHULE, ZURICH (SWITZERLAND).
SCOTIA). INST. OF OCEANOGRAPHY.	DIRECTORATE.	INSTITUT FUER MOLEKULARBIOLOGIE UND
The Transport of Organic Carbon to Organisms	Special Analysis of Short Inertial-Internal	BIOPHYSIK.
Living in the Deep Oceans, W74-04790 5C	Wave Records,	Concerning Large-Scale Cultivation of Thermo-
W 74-04790 SC	W74-04489 2E	philic Cosmopolitan Mastigocladus Laminousus
DELAWARE UNIV., NEWARK.	And the state of the Court of Builting	Cohn (Cyanophyta) in Icelandic Hot Springs, W74-04486
Research in the Coastal and Oceanic Environ-	Application of the Concept of Rectilinear Vor-	11.1100
ment. A Summary of Research Accomplished	tices to the Movement of Oil Slicks, W74-04490 5B	EKONO, HELSINKI (FINLAND).
Under Project Themis,	11 /4-04970 3B	Study of Pulp and Paper Industry's Effluen
W74-04732 2L	DEPARTMENT OF THE NAVY,	Treatment.
DELAWARE UNIV., NEWARK. COLL. OF	WASHINGTON, D.C.	W74-04538 5E
MARINE STUDIES.	Environmental Monitoring and Disposal of	ENGINEERING-SCIENCE, INC., CINCINNATI,
A Refraction Study and Program for Periodic	Radioactive Wastes from U.S. Naval Nuclear-	оню.
Waves Approaching a Shoreline, and Extend-	Powered Ships and Their Support Facilities,	Management of Stormwater Runoff in Subur
ing Beyond the Breaking Point,	1972,	ban Environments,
W74-04340 8B	W74-04441 5B	W74-04302 5I

GEOLOGICAL SURVEY, MENLO PARK, CALIF.

ENVIRONMENTAL PROTECTION AGENCY,	Production of Epilithiphyton in Two Lakes of	GENERAL ELECTRIC CO., PHILADELPHIA,
WASHINGTON, D.C. (ASSIGNEE).	the Experimental Lakes Area, Northwestern	PA.
Processes for Reducing the Organic-Carbon	Ontario,	Mathematical Modeling for Status Prediction
Content of Water Contaminated with Organic	W74-04787 5C	and Control of Water Distribution Systems, W74-04320 4A
Compounds by Continuous Countercurrent Multistage Treatment with Activated Carbon,	Eutrophication of Lake 227 by Addition of	
W74-04704 5D	Phosphate and Nitrate: The Second, Third, and	GEOLOGICAL SURVEY, ALBANY, N.Y.
W/4-04/04	Fourth Years of Enrichment, 1970, 1971, and	Chemical Quality of Streams, Allegheny River
ESSA INST. FOR OCEANOGRAPHY,	1972,	Basin and Part of the Lake Erie Basin, New York,
ROCKVILLE, MD.	W74-04789 5C	W74-04593 2K
Numerical Computations of Storm Surges with	FLEET NUMERICAL WEATHER FACILITY,	1174333
Bottom Stress,	MONTEREY, CALIF.	GEOLOGICAL SURVEY, AUSTIN, TEX.
W74-04759 2L	A Review of Oceanographic Variables and	Quantity and Chemical Quality of Low Flow in
ESSO PRODUCTION RESEARCH CO.,	Their Analyses and Predictions Over the Con-	the East Fork San Jacinto and West Fork San
HOUSTON, TEX.	tinental Shelf,	Jacinto Rivers near Houston, Texas, June 24, 26, 1969.
Permafrost Protection for Pipelines,	W74-04329 2L	W74-04481 5B
W74-04415 2C	FLORIDA STATE UNIV., TALLAHASSEE.	
	GEOPHYSICAL FLUID DYNAMICS INST.	Effects of Urbanization on Floods in the Dal-
ETABLISSEMENTS HUTCHINSON	Harmonic Generation of Shallow Water Waves	las, Texas, Metropolitan Area, W74-04483 4C
CAMPAGNIE NATIONALE DU	Over Topography,	W74-04483 4C
CAOUTCHOUC, PARIS (FRANCE)(ASSIGNEE). Anti-Pollution Barrier,	W74-04323 2E	Ground-Water Data for Harris County, Texas:
W74-04705 5G		Volume I. Drillers' Logs of Wells, 1905-71.
1177 07705	FLORIDA STATE UNIV., TALLAHASSEE.	W74-04602 4B
FISHERIES RESEARCH BOARD OF CANADA,	OCEANOGRAPHIC INST. Drastic Beach Changes in a Low-Energy En-	Water Quality Records for the Hubbard Creek
NAMAIMO (BRITISH COLOMBIA). PACIFIC	vironment Caused by Hurricane Betsy,	Watershed, Texas, October 1969-September
OCEANOGRAPHIC GROUP.	W74-04756 2J	1972,
Reproduction of Estuarine Structure and Cur-	W/4-04/30	W74-04606 5B
rent Observation Techniques in the Hecate	FLORIDA UNIV., GAINESVILLE. COASTAL	
Model, W74-04724 2L	ENGINEERING LAB.	GEOLOGICAL SURVEY, BATON ROUGE, LA.
W74-04724 2L	Longshore Currents in One and Multi-Bar	Availability of Ground Water in the Winnsboro Area, Louisiana,
FISHERIES RESEARCH BOARD OF CANADA,	Profiles Relation to Littoral Drift,	W74-04596 4B
VOL 30, NO 10, P 1441-1445, OCTOBER 1973. 2	W74-04749 2L	117 01370
FIG, 1 TAB, 9 REF.	FLORIDA UNIV., GAINESVILLE. DEPT. OF	GEOLOGICAL SURVEY, BOISE, IDAHO.
A Syringe Gas-Stripping Procedure for Gas-	COASTAL AND OCEANOGRAPHIC	Suspended and Bedload Sediment Transport in
Chromatographic Determination of Dissolved	ENGINEERING.	the Snake and Clearwater Rivers in the Vicinity
Inorganic and Organic Carbon in Fresh Water	Breaking Wave Criteria; A Study Employing a	of Lewiston, Idaho, W74-04846 2J
and Carbonates in Sediments,	Numerical Wave Theory,	W 74-04640 23
W74-04788 5A	W74-04610 2E	GEOLOGICAL SURVEY, BOSTON, MASS.
FISHERIES RESEARCH BOARD OF CANADA,	Application of Fluorescent Coated Sand in Lit-	Groundwater Investigations in Permafrost Re-
WEST VANCOUVER (BRITISH COLUMBIA).	toral Drift and Inlet Studies,	gions of North America: A Review,
PACIFIC ENVIRONMENT INST.	W74-04616 2L	W74-04391 2F
Bioassay Procedures to Evaluate Acute Toxici-		GEOLOGICAL SURVEY, HELENA, MONT.
ty of Neutralized Bleached Kraft Pulp Mill Ef-	A Field Investigation of Sand Transport in the	Evaluation of the Ground-Water Supply at
fluent to Pacific Salmon,	Surf Zone,	Eight Sites in Glacier National Park,
W74-04779 5C	W74-04619 2J	Northwestern Montana,
FISHERIES RESEARCH BOARD OF CANADA,	FMC CORP., PRINCETON, N.J. RESEARCH	W74-04469 2F
WEST VANCOUVER (BRITISH COLUMBIA).	AND DEVELOPMENT DEPT.	Evaluation and Simulation of Chemical-Quality
VANCOUVER LAB.	Hydrogen Peroxide for Industrial Pollution	Data for Five Montana Sampling Stations,
Effects of Cadmium and Copper on the Oxida-	Control,	W74-04484 2K
tion of Lactate by Rainbow Trout (Salmo gaird-	W74-04532 5D	OPOLOGICAL CURVEY TOWN CITY TOWN
nert) Gills,	PORECT CERTICE (ICRA) COLLECE	GEOLOGICAL SURVEY, IOWA CITY, IOWA. Hydrogeologic Considerations in Solid Waste
W74-04780 5C	FOREST SERVICE (USDA), COLLEGE, ALASKA. INST. OF NORTHERN FORESTRY.	Storage in Iowa: Part 1. Sanitary Landfill Site
FISHERIES RESEARCH BOARD OF CANADA,	Ecological Effects of River Flooding and	Selection: Part 2. A Method of Hazardous and
WINNIPEG (MANITOBA). FRESHWATER	Forest Fires on Permafrost in the Taiga of	Toxic Waste Disposal,
INST.	Alaska,	W74-04592 SE
Apparatus for Recording Avoidance Move-	W74-04352 2C	
ments of Fish,		Mississippian Aquifer of Iowa, W74-04843 7C
W74-04776 5A	FREIBURG UNIV. (WEST GERMANY).	W 74-04043
11 - 1 - 01 - 0 - 11 - 1 - 1 - 1 - 1 - 0 - 0	Chironomidae (Diptera) from the Area of	GEOLOGICAL SURVEY, JACKSON, MISS.
Use of a Silver-Sulfide Electrode for Stan- dardizing Aqueous Sulfide Solution in Deter-	Freiburg in Breisgau (with Special Considera- tion of the Genus Chironomus), (In German),	Hydraulic Performance of Bridges-Excava-
mining Sulfide in Water,	W74-04678 2H	tions at Bridges,
W74-04777 5A		W74-04482 8B
	GCA CORP., BEDFORD, MASS. GCA	GEOLOGICAL SURVEY, LINCOLN, NEBR.
Measurement of Adenosine Triphosphate	TECHNOLOGY DIV.	Characteristics of Streamflow at Gaging Sta-
(ATP) in Two Precambrian Shield Lakes of	Waste Automotive Lubricating Oil as a Mu-	tions in the Loup River Basin, Nebraska,
Northwestern Ontario,	nicipal Incinerator Fuel,	W74-04794 2E
W74-04782 5B	W74-04549 5D	GEOLOGICAL SURVEY, MENLO PARK,
Diurnal Variation of Dissolved Inorganic Car-	GENERAL DYNAMICS, SAN DIEGO, CALIF.	CALIF.
bon and its Use in Estimating Primary Produc-	CONVAIR AEROSPACE DIV.	Mapping and Predicting Permafrost in North
tion and CO2 Invasion in Lake 227,	Air Pollution Measurements From Satellites,	America: A Review, 1963-1973,
W74-04784 5A	W74-04485 5A	W74-04398 2C

GEOLOGICAL SURVEY, MENLO PARK, CALIF.

Permafrost-Related Engineering Geology	GEORGE WASHINGTON UNIV.,	HAWAII UNIV., HONOLULU. WATER
Problems Posed by the Trans-Alaska Pipeline, W74-04416 8D	WASHINGTON, D.C. DEPT. OF MANAGEMENT SCIENCES.	RESOURCES RESEARCH CENTER. The Response to Tidal Fluctuations of a Leaky
W /4-04410	Evaluation of the Use of Pricing as a Tool for	Aquifer System,
GEOLOGICAL SURVEY OF CANADA,	Conserving Water,	W74-04308 2F
OTTAWA (ONTARIO).	W74-04810 3D	
The Application of Shallow Seismic Methods to Mapping of Frozen Surficial Materials,	GEORGETOWN UNIV., WASHINGTON, D.C.	Baseline Quality Data for Kalihi Stream, W74-04309 5B
W74-04401 2C	DEPT. OF BIOLOGY.	
Some Effects of Surface Disturbance on the Permafrost Active Layer at Inuvik, N.W.T.,	Temperature Acclimation in the Medusa, Chrysaora quinquecirrha, W74-04660 5C	HEBREW UNIV., JERUSALEM (ISRAEL). Application of Dynamic Programming in Markov Chains to the Evaluation of Water Quality
Canada,	117-01000	in Irrigation,
W74-04413 4C	GEORGIA COLL., MILLEDGEVILLE. DEPT.	W74-04561 3C
GEOLOGICAL SURVEY, RESTON, VA.	OF BUSINESS ADMINISTRATION AND ECONOMICS.	HITTMAN ASSOCIATES, INC., COLUMBIA,
The Operation of a Stream-Aquifer System	What's Wrong with Government Water Control	MD. Approaches to Stormwater Management,
Under Stochastic Demands, W74-04808 4B	Programs and how They can be Improved, W74-04632 5D	W74-04458 5A
CROLOGICAL CURVEY RECTON VA	W74-04632 5D	HOKKAIDO UNIV., SAPPORO (JAPAN). DEPT.
GEOLOGICAL SURVEY, RESTON, VA. WATER RESOURCES DIV.	GEORGIA UNIV., ATHENS. DEPT. OF	OF ENGINEERING SCIENCE.
The Need of Geological Investigations for the	GEOLOGY. Studies on the Validity of Darcy's Law for	Transformation, Breaking and Run-Up of a
Development of the Ground Water Resources	Flow in Natural Sands,	Long Wave of Finite Height, W74-04741 2L
of the Republic of Korea, W74-04466 4B	W74-04307 2F	W/4-04/41
		HOKUETSU PAPER MILLS CO., LTD.,
GEOLOGICAL SURVEY, ROLLA, MO. WATER RESOURCES DIV.	GEORGIA UNIV., SAPELO ISLAND. MARINE INST.	NAGAOKA (JAPAN). RESEARCH LAB. Application of Polyacrylamide to Pulp Mill Ef-
Water Resources Applications,	Beach Profiles of a Georgia Barrier Island,	fluents (In Japanese),
W74-04584 7B	W74-04736 2J	W74-04529 5D
GEOLOGICAL SURVEY, TACOMA, WASH.	Eolian Cross-Bedding in the Beach Dune En-	HOUDAILLE INDUSTRIES, INC., BUFFALO,
Relative Susceptibility of Lakes to Water- Quality Degradation in the Southern Hood	vironment, Sapelo Island, Georgia, W74-04737 2J	N.Y. (ASSIGNEE). Method of Treating Sewage Using High
Canal Area, Washington,		Polymer Ratio Flocculation Agent Biologically
W74-04488 5B	High-Angle Beach Stratification, Sapelo Island, Georgia,	Produced in Situ, W74-04717 5D
A Proposal for the Investigation of Possible	W74-04738 2J	W/4-04/1/
Ground-Water Contamination in the Bangor	DI 1 1 DI 1 M 1 T I	HYDRAULICS RESEARCH STATION,
Area, Kitsap County, Washington,	Rhomboid Ripple Mark, Indicator of Current Direction and Environment,	WALLINGFORD (ENGLAND). Variable Dispersion and Its Effects on the
W74-04491 5B	W74-04739 2J	Movements of Tracers on Beaches,
Surface- and Ground-Water Conditions During		W74-04618 2J
1959-61 in a Part of Flett Creek Basin, Tacoma,	Development and Geologic Significance of Soft	Similarity in Sediment Transport Due to
Washington, W74-04796 2E	Beach Sand, W74-04757 2J	Waves,
		W74-04755 2J
GEOLOGICAL SURVEY, TALLAHASSEE, FLA.	GERAGHTY AND MILLER, PORT	HYDRONAUTICS, INC., LAUREL, MD.
Hydrogeologic Characteristics of the Surficial Aquifer in Northwest Hillsborough County,	WASHINGTON, N.Y. Ground Water and the Geothermal Resource.	Physical and Dynamical Scales for Generation
Florida,	W74-04586 4B	of Wind Waves,
W74-04468 2F		W74-04330 2E
Effects of Backpumping from South New	GLASGOW UNIV. (SCOTLAND).	ILLINOIS STATE WATER SURVEY, URBANA.
River Canal at Pump Station S-9 on Quality of	Pore Water and Heaving Pressures Developed in Partially Frozen Soils,	Summary Report of Metromex Studies, 1971-
Water in Water-Conservation Area 3, Broward	W74-04389 2C	1972.
County, Florida, W74-04600 5B	GORI AGRICULTURAL INST. (USSR). DEPT.	W74-04509 2B
W 74-04000	OF ORGANIC BIOLOGICAL CHEMISTRY.	ILLINOIS UNIV., URBANA. DEPT. OF
Hydrologic and Geologic Considerations for	Effect of Fertilizers and Irrigation Conditions	ZOOLOGY.
Solid-Waste Disposal in West-Central Florida, W74-04605 5E	on Yield, Chemical Composition, Baking Quali-	Scanning Electron Microscopy of Fixed, Frozen, and Dried Protozoa,
	ties of Winter Wheat Grain of Bezostaya 1 Cul- tivar, (In Russian),	W74-04497 7B
GEOLOGICAL SURVEY, UNIVERSITY, ALA. Surface-Water Availability, Lauderdale Coun-	W74-04830 3F	IMPERIAL COLL. OF SCIENCE AND
ty, Alabama,		TECHNOLOGY, LONDON (ENGLAND). DEPT.
W74-04494 2E	GORKOVSKII ZAVOD ORGSINTEZ (USSR). Catalytic Oxidation and Thermal Treatment of	OF CIVIL ENGINEERING. Estuarine Currents and Tidal Streams.
GEOLOGICAL SURVEY, WASHINGTON, D.C.	Waste Waters (Kataliticheskoe okislenie i ter-	W74-04344 2L
Reconnaissance of the Ground-Water	micheskoe obezvrezhivanie stochnykh vod), W74-04537 5D	INDIAN INST. OF TECH., KHARAGPUR, DEPT.
Resources of Cimarron County, Oklahoma, W74-04495 4B		OF CIVIL ENGINEERING.
	GOSUDARSTVENNYI KOMITET PO	Effect of Entrance on Seiche Motion in Ocean
Lakes in the Boulder-Fort Collins-Greeley	ISPOLZOVANIYU ATOMNOI ENERGII SSSR, MOSCOW.	Ports,
Area, Front Range Urban Corridor, Colorado, W74-044% 2H	Disposal of Radioactive Wastes,	W74-04743 2L
	W74-04445 SD	INDIANA UNIV., BLOOMINGTON. DEPT. OF
GEOLOGICAL SURVEY, WASHINGTON, D.C.	HALCROW (WILLIAM) AND PARTNERS,	ZOOLOGY.
OFFICE OF REMOTE SENSING. Operational and Experimental Remote Sensing	LONDON (ENGLAND).	The Thermal Regime of Lake Lanao (Philippines) and its Theoretical Implications
in Hydrology,	Waves Off Benghazi Harbour - Libya,	for Tropical Lakes,
W74-04570 7B	W74-04608 2L	W74-04665 2H

LOUISIANA STATE UNIV., BATON ROUGE.

NDIANA UNIV., BLOOMINGTON. SCHOOL OF PUBLIC AND ENVIRONMENTAL AFFAIRS.	KASPIISKII NAUCHNO-ISSLEDOVATELSKII INSTITUT RYBNOGO KHOZYAISTVA,	KYOTO UNIV. (JAPAN). DEPT. OF CIVIL ENGINEERING.
A Report on the Limnology of Monroe Reservoir, Indiana,	ASTRAKHAN (USSR). Parasite Fauna of Ctenopharyngodon idella	Hyperbolic Waves and Their Shoaling, W74-04611 2E
W74-04792 2H	from Pond- and Spawning-Nursery Fisheries in the Volga Delta, (In Russian),	KYOTO UNIV. (JAPAN). DISASTER;
NSTITUT NATIONAL DE LA RECHERCHE	W74-04702 8I	PREVENTION RESEARCH INST.
AGRONOMIQUE, THONON-LES-BAINS	KASPIISKII NAUCHNO-ISSLEDOVATELSKII	Hydraulic Model Experiment on the Duffusion Due to the Coastal Current,
FRANCE). STATION D'HYDROBIOLOGIE LACUSTRE.	INSTITUT RYBNOGO KHOZYAISTVA,	W74-04628 5B
Comparative Study, in 1966 and 1967, of Three	MAKHACHKALA (USSR). Feeding of Juvenile Carp Cyprinus carpio L. in	Laboratory Study of Scale Effects in Two-
Reservoirs in the Project of a Natural Park in	the Arakum Bodies of Water (Delta of the	Dimensional Beach Processes,
the Morvan Region (In French), W74-04815 5C	Terek River) at Early Developmental Stages,	W74-04748 21.
	(In Russian), W74-04649 2L	KYUSHU UNIV., FUKUOKA (JAPAN).
NSTITUTE FOR LAND AND WATER MANAGEMENT RESEARCH, WAGENINGEN		FACULTY OF AGRICULTURE. Color of Pulp Industry Waste Liquors. III. The
NETHERLANDS).	KENTUCKY DEPT. OF HEALTH, FRANKFORT. RADIOLOGICAL HEALTH	Interaction of Chloro-Oxylignin with Metal
Water Withdrawal by Plant Roots,	PROGRAM.	Salts (In Japanese),
W74-04655 3F	A History and Preliminary Inventory Report on the Kentucky Radioactive Waste Disposal Site,	W74-04512 5D
NSTITUTE OF MARINE RESEARCH,	W74-04442 SB	LA PLATA UNIV. (ARGENTINA). INSTITUTO
HELSINKI (FINLAND). BIOLOGY DIV.		DE LIMNOLOGIA. Ecology and Biocoenology of Lagunas or
Effects of Toxicants on Brackish-Water Phytoplankton Assimilation,	KENTUCKY UNIV., LEXINGTON. DEPT. OF CIVIL ENGINEERING.	Lakes of Third Order of the Temperate
W74-04644 5C	Remote Sensing in Sampling Site Location in	Neotropical Region (Southeast Pampasic Re-
	Lakes and Streams,	gion of Argentina), (In Spanish), W74-04817
NSTITUTO VENEZOLANO DE INVESTIGACIONES CIENTIFICAS, CARACAS.	W74-04313 5A	
Striated Ground, A Type of Patterned Ground	KENTUCKY WATER RESOURCES INST.,	LAMONT-DOHERTY GEOLOGICAL
in the Periglacial Area of the Venezuelan	LEXINGTON. A Detailed Investigation of the Sociological,	OBSERVATORY, PALISADES, N.Y. Distribution and Uptake of Artificially In-
Andes, (In Spanish), W74-04651 2G	Economic, and Ecological Aspects of Proposed	troduced Radium-226 in a Small Lake,
W/4-04631 20	Reservoir Sites in the Salt River Basin of Ken-	W74-04785 SE
INSTITUUT VOOR GRAFISCHE TECHNIEK	tucky, W74-04310 2A	LANDERARBEITSGEMEINSCHAFT WASSER,
FNO, AMSTERDAM (NETHERLANDS). Water Pollution in the Netherlands.	VENEZICKY WAREN DEGOLEDORG DEGOLADOR	MAINZ (WEST GERMANY). Principles of Evaluating Effects of Therma
W74-04536 5B	KENTUCKY WATER RESOURCES RESEARCH INST., LEXINGTON.	Discharges on Surface Waters (Grundlagen fu
	Sociocultural Impact of Reservoirs on Local	die Beurteilung der Warmebelastungen von
INSTYTUT BALNEOKLIMATYCZNY, POZNAN (POLAND).	Government Institutions, Anthropological	Gewassern). W74-04764 50
Some Problems Involved in Optimal Protection	Analysis of Social and Cultural Benefits and Costs from Stream Control MeasuresPhase 4,	W74-04764 50
of the Environment in Spas,	W74-04311 6B	LAVAL UNIV., QUEBEC.
W74-04847 5G	KHARKOV STATE UNIV. (USSR).	Postglacial Permafrost Features in Eastern Canada,
IOWA UNIV., IOWA CITY. INST. OF	Phytoplankton Dynamics in the Severskiy	W74-04358 20
HYDRAULIC RESEARCH.	Donets River for the First Years After its	LEEDS, HILL AND JEWETT INC., LOS
A Laboratory Investigation of Free Surface	Regulation, (In Russina), W74-04648 5C	ANGELES, CALIF.
Flows Over Wavy Beds, W74-04477 8B		Mean Direction of Waves and of Wave Energy
	KIEL UNIV. (WEST GERMANY). INSTITUT FUER MEERESKUNDE.	W74-04328 2
IRKUTSKII GOSUDARSTVENNYI UNIVERSITET (USSR).	Hydrocarbon and Chlorophyll: A Correlation in	LEEDS UNIV. (ENGLAND). DEPT. OF CIVIL
Subglacial Development of Chlorella in Baikal,	the Upwelling Region off West Africa,	ENGINEERING. Ouickelays as Products of Glacial Action: A
(In Russian),	W74-04771 5B	New Approach to Their Nature, Geology, Dis
W74-04647 2H	KIEL UNIV. (WEST GERMANY). ZOOLOGISCHES INSTITUT.	tribution and Geotechnical Properties,
IRON ORE CO. OF CANADA,	Ecological Investigations of Ponds with Special	W74-04590 20
SCHEFFERVILLE (QUEBEC).	Regard to the Consequences of Water Pollution	LIVERPOOL UNIV. (ENGLAND). DEPT. OF
In Situ Physicomechanical Properties of Per-	by Oil, (In German),	CIVIL ENGINEERING. Shear Velocity in a Tidal Estuary,
mafrost Using Geophysical Techniques, W74-04399 2C	W74-04635 5C	W74-04629 21
	KING'S COLL., LONDON (ENGLAND). DEPT.	LONDON SCHOOL OF ECONOMICS AND
JOHNS HOPKINS UNIV., BALTIMORE, MD. CHESAPEAKE BAY INST.	OF GEOGRAPHY. Slope Development on a Mississippi River	POLITICAL SCIENCE (ENGLAND).
Field Measurements of Swell Off the Island of	Bluff in Historic Time,	Accumulation on the Devon Island Ice Cap
Aruba,	W74-04585 2J	Northwest Territories, Canada, W74-04325
W74-04723 2E	KURITA WATER INDUSTRIES LTD., OSAKA	
KANSAS UNIV., LAWRENCE.	(JAPAN). (ASSIGNEE). Process for Purifying Water that Contains Or-	LOS ALAMOS SCIENTIFIC LAB., N. MEX. Ecodistribution of Plutonium in Liquid Wast
Capitalization of the Benefits of Water	ganic Matter,	Disposal Areas at Los Alamos,
Resource Development, W74-04501 6B	W74-04716 5D	W74-04443 51
	KYOTA UNIV. (JAPAN). DISASTERS	LOUISIANA STATE UNIV., BATON ROUGE.
KARACHI UNIV. (PAKISTAN).	PREVENTION RESEARCH INST.	The Nature of the Seawater-Freshwater Inter
The Fallacy of Baer's Law or Coriolis' Effect on the Meandering of Rivers,	A Study on Mass Transport in Boundary Layers in Standing Waves,	face During Breakup in the Colville River Delta, Alaska,
W74-04799 8B	W74-04615 2J	W74-04397 20

2C

LOUISIANA STATE UNIV., BATON ROUGE COASTAL STUDIES INST.

LOUISIANA STATE UNIV., BATON ROUGE. COASTAL STUDIES INST. Collective Movement of Sediment in Littoral	MARYLAND GEOLOGICAL SURVEY, BALTIMORE. Response and Recovery of a Piedmont	MICHIGAN UNIV., ANN ARBOR. A Simulation Sensitivity Analysis of the Needle Ice Growth Environment,
Environment,	Watershed from Tropical Storm Agnes, June	W74-04370 2C
W74-04621 2J	1972, W74-04805 2J	MICHIGAN UNIV., ANN ARBOR. DEPT. OF
Simulation of Horizontal Turbulent Diffusion of Particles Under Waves,	MASSACHUSETTS INST. OF TECH.,	CIVIL ENGINEERING. Physicochemical Processes for Water Quality
W74-04624 2J	CAMBRIDGE. DEPT. OF CIVIL ENGINEERING.	Control,
Selected Bibliography on Beach Features and	Growth of Longshore Currents Downstream of	W74-04546 5D
Related Nearshore Processes. W74-04728 2J	a Surf-Zone Barrier, W74-04324 2J	MILWAUKEE SEWERAGE COMMISSION, WIS.
LOYOLA UNIV., LOS ANGELES, CALIF.	MASSACHUSETTS UNIV., AMHERST. DEPT.	200 MGD Activated Sludge Plant Removes
Multi-Dimensional Aspects of Eddy Diffusion Determined by Dye Diffusion Experiments in	OF AGRICULTURAL AND FOOD	Phosphorus by Pickle Liquor, W74-04554 5D
Coastal Waters (Summary),	ECONOMICS. Institutional Framework Affecting the Use of	MINISTRY OF THE ENVIRONMENT.
W74-04322 2L	Inland Wetlands in Massachusetts, W74-04462 4A	REXDALE (ONTARIO). WATER QUALITY
LUND INST. OF TECH. (SWEDEN). Urbanization: A Hydrological Headache,		BRANCH. Nutrients in Subsurface and Runoff Waters of
W74-04642 4C	Flood Proofing Decisions Under Uncertainty: An Application to the Connecticut River Basin,	the Holland Marsh, Ontario, W74-04478 5B
LURGI APPARATE-TECHNIK G.M.B.H.,	W74-04463 6A	
FRANKFURT AM MAIN (WEST GERMANY). Modern Waste Water Treatment and	MAX-PLANCK-INSTITUT FUER	MINISTRY OF TRANSPORTATION, YOKOSUKA (JAPAN). PORT AND HARBOUR
Processing Techniques in the Paper and Board	ZUECHTUNGSFORSCHUNG, COLOGNE (WEST GERMANY).	RESEARCH INST.
Industry (Moderne Abwasseraufbereitungs-und Verfahrenstechnik in der Papier- und Kartonin-	A Comparative Study of the Size and Receptivity of the Stigma in Wheat, Rye, Triticale	A Study of Critical Depth and Mode of Sand Movement Using Radioactive Glass Sand,
dustrie),	and Secalotricum,	W74-04752 2J
W74-04517 5D	W74-04690 3F	Approximate Estimations of Correlation Coef-
MACKENZIE VALLEY PIPELINE RESEARCH LTD., CALGARY (ALBERTA).	MAXWELL GRADUATE SCHOOL OF CITIZENSHIP AND PUBLIC AFFAIRS.	ficient Between Wave Height and Period of Shallow Water Wind Waves,
Effects of Ground-Ice Variability and Resulting	SYRACUSE, N.Y. METROPOLITAN AND	W74-04761 2L
Thaw Settlements on Buried Warm-Oil Pipelines,	REGIONAL RESEARCH CENTER. Land Value Increments as a Measure of the	MINISTRY OF WATER AND POWER, TEHRAN
W74-04422 4C	Net Benefits of Urban Water Supply Projects	(IRAN). Groundwater Investigation and Management in
Performance of a Warm-Oil Pipeline Buried in	in Developing Countries: Theory and Measure- ment,	Iran,
Permafrost, W74-04423 8D	W74-04502 6B	W74-04569 7B
MACQUARIE UNIV., NORTH RYDE	MCGILL UNIV., SCHEFFERVILLE (QUEBEC). MCGILL SUB-ARCTIC RESEARCH LAB.	MINNESOTA UNIV., ST. PAUL. DEPT. OF AGRICULTURAL ENGINEERING.
(AUSTRALIA). SCHOOL OF EARTH SCIENCES.	Indirect Mapping of the Snowcover for Per-	A Simulation Model for Evaluating Irrigation
A Numerical Classification of Selected Land-	mafrost Prediction at Schefferville, Quebec, W74-04356 2C	Management Practices, W74-04564 3F
slides of the Debris Slide-Avalanche-Flow Type,	Permafrost and Snowcover Relationships Near	MONO PUMPS (ENGINEERING) LTD.,
W74-04591 2J	Schefferville,	LONDON (ENGLAND). (ASSIGNEE).
MAGYAR TUDOMANYOS AKADEMIA,	W74-04362 2C	Method and Apparatus for Treating Effluent, W74-04714 5D
TIHANY. BIOLOGICAL RESEARCH INST. A Possible Explanation for the Differences in	MCGILL UNIV., SCHEFFERVILLE (QUEBEC). MCGILL SUB-ARTIC RESEARCH LAB.	MOSCOW STATE UNIV. (USSR). DEPT. OF
the Fatty Acid Composition of Fresh-Water	Studies at the Timmins 4 Permafrost Experi-	OCEANOLOGY.
and Marine Fishes, W74-04688 5C	mental Site, W74-04363 2C	Comments on Veronis' Paper, 'On Properties of Seawater Defined by Temperature, Salinity,
Distribution of Organic Matter and Bacteria in	META SYSTEMS, INC., SPRINGFIELD, VA.	and Pressure',
the Upper Layer of Bottom Deposit of Lake	An Assessment of the Use of Potomac Estuary	W74-04658 2K
Balaton, W74-04839 5B	Waters and AWT Effluents for Emergency Water Supply,	MOSKOVSKII GOSUDARSTVENNYI MEDITSINSKII INSTITUT (I) (USSR).
MAINZ UNIV. (WEST GERMANY). HYGIENE	W74-04506 5D	Ozonization as a Method of Purifying Water
INSTITUT. Thin-Layer and Gas-Chromatographic Deter-	METCALF AND EDDY, INC., BOSTON, MASS. A Groundwater Supply for an Oil Camp Near	Polluted with Chemical Composition, (In Russian),
mination of Phenols Present in Water, (In Ger-	Prudhoe Bay, Arctic Alaska,	W74-04836 5D
man), W74-04684 5A	W74-04396 2F	NATIONAL AERONAUTICS AND SPACE
MAKERERE UNIV., KAMPALA (UGANDA).	MICHIGAN DEPT. OF NATURAL RESOURCES, ANN ARBOR. INST. FOR FISHERY	ADMINISTRATION, LANGLEY STATION, VA. LANGLEY RESEARCH CENTER.
DEPT. OF ZOOLOGY.	RESEARCH.	Modeling of Turbulent Transport in the Surface
Benthic Fauna of a Tropical Man-Made Lake (Volta Lake, Ghana 1965-1968),	The Effects of Methoxychlor on Aquatic Biota, W74-04553 5C	Layer, W74-04795 2D
W74-04636 2H	MICHIGAN STATE UNIV., EAST LANSING.	NATIONAL COUNCIL OF THE PAPER
MANITOBA UNIV., WINNIPEG. DEPT. OF	DEPT. OF PHYSIOLOGY.	INDUSTRY FOR AIR AND STREAM
MICROBIOLOGY. Heterotrophic Utilization of Sucrose in an Ar-	Mercury Uptake and Ion Distribution in Gills of Rainbow Trout (Salmo gairdneri): Tissue	IMPROVEMENT, INC., NEW YORK. 1972 Review of the Literature on Pulp and
tificially Enriched Lake, W74-04781 5C	Scans with an Electron Microprobe, W74-04778 5A	Paper Effluent Management, W74-04540 5D
30	mirotile JA	11 /1-01310

ORGANIZATIONAL INDEX ORGANIZATION MASSACHUSETTS UNIV., AMHERST. SCHOOL OF ENGINEERING.

NATIONAL ENGINEERING SCIENCE CO., WASHINGTON, D.C.	NAVAL CIVIL ENGINEERING LAB., PORT HUENEME. CALIF.	NORTH CAROLINA UNIV., CHAPEL HILL. CENTER FOR URBAN AND REGIONAL
On Non-Saturated Breakers and the Wave Run-	Ice EngineeringSummary of Elastic Proper-	STUDIES.
Up,	ties Research and Introduction to Viscoelastic	Multipurpose Reservoirs and Urban Develop-
W74-04742 2L	and Nonlinear Analysis of Saline Ice, W74-04793 2C	ment, W74-04319 6B
Modification of Wave Spectra on the Continen-		NORTH CROLINA STATE UNIV. BALLICH
tal Shelf and in the Surf Zone, W74-04762 2L	NAVAL POSTGRADUATE SCHOOL, MONTEREY, CALIF.	NORTH CROLINA STATE UNIV., RALEIGH. DEPT. OF ECONOMICS.
	The Effect of Waves on the Profile of a Natu-	Allocation of Scarce Resources to Agricultural Research: Review of Methodology,
NATIONAL INST. OF OCEANOGRAPHY, WORMLEY (ENGLAND).	ral Beach, W74-04620 2J	W74-04566 3F
An Inexpensive S.T.D. Data Logging System,	NAVY HYDROGRAPHIC OFFICE,	NORTHERN ILLINOIS UNIV., DE KALB.
W74-04772 7C	WASHINGTON, D.C.	Geophysical Identification of Frozen and Un-
NATIONAL RESEARCH COUNCIL OF	A Study of Diffusion in an Estuary,	frozen Ground, Antarctica, W74-04360 2C
CANADA, OTTAWA (ONTARIO).	W74-04333 5B	
Thermal Conditions in PermafrostA Review	An Annotated Bibliography of Flushing and	NUS CORP., PITTSBURGH, PA. CYRUS WM.
of North American Literature,	Dispersion in Tidal Waters,	RICE DIV. Laboratory Study of Self-Sealing Limestone
W74-04347 2C	W74-04731 2L	Plugs for Mine Openings.
Influence of Climatic and Terrain Factors on	NEVADA UNIV., RENO. DESERT RESEARCH	W74-04559 5G
Ground Temperatures at Three Locations in	INST.	OAK RIDGE NATIONAL LAB., OAK RIDGE,
the Permafrost Region of Canada,	Electric Cloud and Weather Modification with	TENN.
W74-04348 2C	Intense Relativistic Electron Beams,	Trans-Pacific Fallout and Protective Counter-
Distribution of Permafrost in North America	W74-04604 3B	measures,
and Its Relationship to the Environment: A	NEW ENGLAND AQUARIUM, BOSTON, MASS.	W74-04454 5B
Review, 1963-1973,	RESEARCH DEPT.	OAK RIDGE NATIONAL LAB., TENN.
W74-04353 2C	Determination of Chromium in Sea Water by	Annual Consumption of Cesium-137 and
NATIONAL SCIENCE FOUNDATION,	Atomic Absorption Spectrometry,	Cobalt-60 Labeled Pine Seeds by Small Mam-
WASHINGTON, D.C. OFFICE FOR THE	W74-04516 5A	mals in an Oak-Hickory Forest, W74-04450 5B
INTERNATIONAL DECADE OF OCEAN	NEW MEXICO UNIV., ALBUQUERQUE.	
EXPLORATION.	Economic Aspects of Ground Water Resources	Zone of Flow Establishment for Round
International Decade of Ocean Exploration.	and Replacement Flows in Semiarid Agricul-	Buoyant Jets, W74-04657 5B
W74-04473 6E	tural Areas,	W /4-0463/
NATIONAL SCIENCE FOUNDATION,	W74-04563 4B	OHIO STATE UNIV., COLUMBUS. DEPT. OF
WASHINGTON, D.C. SCIENCE AND	NEW SOUTH WALES UNIV., KENSINGTON	MICROBIOLOGY.
TECHNOLOGY POLICY OFFICE.	(AUSTRALIA).	Biochemical Ecology of Water Pollution, W74-04523 5C
Federal Water Resources Research Program	A Design Procedure for the Conjunctive Use of	
for 1971. W74-04848 9D	Surface and Groundwater Storages, W74-04598 4B	OREGON STATE UNIV., CORVALLIS.
11/1-04040	W /4-04398 4B	Pink and Chum Salmon Culture, W74-04797 81
NATIONAL SCIENCE FOUNDATION,	Application of the Finite Element Method to	W/4-04/9/
WASHINGTON, D.C. SPECIAL FOREIGN	Convection Heat Transfer Between Parallel	OREGON STATE UNIV., CORVALLIS. DEPT.
CURRENCY SCIENCE INFORMATION	Planes, W74-04765 8B	OF CIVIL ENGINEERING. The Effects of Bottom Configuration on the
PROGRAM. Dynamics and Morphology of Sea Coasts.	W /4-04/03	Deformation, Breaking and Run-Up of Solitary
W74-04425 2J	NEW YORK UNIV., BRONX. SCHOOL OF	Waves,
11 17 01125	ENGINEERING AND SCIENCE.	W74-04613 2E
NATIONAL VEGETABLE RESEARCH	The Elevation, Slope, and Curvature Spectra of	Constituent Transport in Estuaries,
STATION, WELLSBOURNE (ENGLAND).	a Wind Roughened Sea Surface, W74-04476 2E	W74-04627 2L
Spectrophotometric Estimation of Arsenic in Nitric Acid Extracts of Soil and Soil Additives,		ODDGON CTATE WATER CORVAILED DEBT
W74-04769 5A	NICOLAS COPERNICUS UNIV. OF TORUN (POLAND), INST. OF BIOLOGY.	OREGON STATE UNIV., CORVALLIS. DEPT. OF OCEANOGRAPHY.
NATIONAL WATER QUALITY LAB., DULUTH,	Observations on the Vegetation of the	Spectra of the Temperature and Humidity Fluc- tuations and of the Fluxes of Moisture and Sen-
MINN.	Koronowo Reservoir,	sible Heat in the Marine Boundary Layer
Temperature Requirements for Embryos and	W74-04654 2I	W74-04672 2F
Larvae of the Northern Pike, Esox lucius	NIIGATA UNIV. (JAPAN). FACULTY OF	Inshore Sea Surface Temperature and Salinity
(Linnaeus), W74-04670 5C	AGRICULTURE.	Conditions at Agate Beach, Yaquina Bay and
W/4-046/0	Strontium-90 and Cesium-137 Levels in Soils of	Whale Cove, Oregon, in 1970,
NAUCHNO-ISSLEDOVATELSKII INSTITUT	Various Types at Niigata Prefecture, Japan, W74-04453 5B	W74-04730 2L
GIGIENY, MOSCOW (USSR).	W/4-0433	OREGON STATE UNIV., CORVALLIS.
Salmonella Serotypes in Sewage of Various	NORGES TEKNISKE HOEGSKOLE,	SCHOOL OF OCEANOGRAPHY.
Origins, W74-04850 5B	TRONDLHEIM. DEPT. OF HARBOUR	Verification of Water Temperature Forecasts
W74-04850 5B	ENGINEERING. Quantitative Tracing of Littoral Drift,	for Deep, Stratified Reservoirs,
NAUCHNO-ISSLEDOVATELSKII	W74-04617 2J	W74-04807 4A
RADIOFIZICHESKII INSTITUT, GORKII		ORGANIZATION MASSACHUSETTS UNIV.,
(USSR).	NORTH CAROLINA STATE UNIVERSITY AT	AMHERST. SCHOOL OF ENGINEERING.
Propagation of a Finite-Amplitude Surface Wave With Allowance for Random Irregulari-	RALEIGH. DEPARTMENT OF CHEMISTRY. Determination of the Complexing Capacity of	Laboratory Experiments to Determine the Structural Response of a Vertical Pile Sub-
ties of the Bottom,	Natural Water,	jected to Wind-Generated Water Waves,
W74-04841 2J	W74-04312 2K	W74-04424 8E

	ORGANIZATIONAL INDEX	
OSLO UNIV. (NORWAY) ZOOLOGICAL LAB.		
OSLO UNIV. (NORWAY). ZOOLOGICAL LAB. Polluted Snow in Southern Norway During the	PYE RESEARCH CENTER, STOWMARKET (ENGLAND).	Managua, Nicaragua, during the Summer of 1973,
Winters 1968-1971, W74-04652 5B	Relations Between Soil Water Potential and Disease in Wheat Seedlings Infected by Puc-	W74-04467 2F SAO PAULO UNIV. (BRAZIL). INST. OF BIO-
OTTAWA UNIV. (ONTARIO).	cinia recondita, W74-04653 3F	SCIENCES. Contribution to Knowledge about the Leaf
Thermokarst Development, Banks Island, Western Canadian Arctic, W74-04368 2C	RAND CORP., SANTA MONICA, CALIF. A Three-Dimensional Model for Estuaries and Coastal Seas: Volume I, Principles of Compu-	Anatomy of Species of a 'Caatinga' of the Rio Negro (Amazon), (In Portuguese), W74-04682 2I
OXFORD UNIV. (ENGLAND). DEPT. OF ENGINEERING SCIENCE.	tation, W74-04301 2L	SCIENCE ENGINEERING ASSOCIATES, INC., SAN MARINO, CALIF.
Convective Heat Transfer to Water Containing Bubbles: Enhancement not Dependent on Ther-	Use of a Computational Model for Two-Dimensional Tidal Flow,	Feasibility Study for a Surge-Action Model of Monterey Harbor, California,
mocapillarity, W74-04664 8B	W74-04631 2L	W74-04721 2L
PACIFIC NORTHWEST ENVIRONMENTAL RESEARCH LAB., CORVALLIS, OREG. Reviewing Environmental Impact Statements-	The Application of Numerical Simulation Models in the Assessment of the Effect of Discharges into Coastal Waters, W74-04674 5B	SCRIPPS INSTITUTION OF OCEANOGRAPHY, LA JOLLA, CALIF. Flume Experiments on Sand Transport by Waves and Currents,
Power Plant Cooling Systems, Engineering	Comments on Johnson's Paper, 'On the Wind-	W74-04746 2L
Aspects, W74-04555 5G	Driven Circulation of a Stratified Ocean', W74-04675 2E	SHIMANE UNIV., MATSUE (JAPAN). FACULTY OF AGRICULTURE.
PAN AMERICAN UNIV., EDINBURG, TEX. DEPT. OF BIOLOGY. Effects of Temperature on Developing Meristic	RAYPAK CO. INC., WESTLAKE VILLAGE. CALIF (ASSIGNEE).	A Study on the Accuracy of Runoff Analysis for Pumping Drainage in Paddy Field Area (In Japanese),
Structures of Smallmouth Bass, Micropterus	Water Cleaning Treatment, W74-04710 3A	W74-04811 4A
dolomieui Lacepede, W74-04663 5C	REGIONAL SCIENCE RESEARCH INST., PHILADELPHIA, PA.	SNOWY MOUNTAINS ENGINEERING CORP., COOMA (AUSTRALIA). Hydrologic Investigation and Design in Urban
PARIS UNIV. (FRANCE). New Contributions to Biological Study of	Estimating the Benefits of Stream Valley and Open Space Preservation Projects, W74-04500 6B	AreasA Review, W74-04597 2A
Genetic Transmission of Resistance to Dryness in Double Hybrids of Zea Mays, W74-04833 3F	REID, MIDDLETON AND ASSOCIATES, INC.,	Hydrologic Data for Small Rural Catchments in Australia, 1973, W74-04842 2E
PAVIA-BYRNE ENGINEERING CORP., NEW	EDMONDS, WASH.; AND POLY SINTERING, INC., SEATTLE, WASH. (ASSIGNEES).	W74-04842 2E STAATLICHES INSTITUT FUER
ORLEANS, LA. Hypochlorination of Polluted Storm-Water	Floating Breakwater Pontoon, W74-04711 8B	SEENFORSCHUNG UND SEENBEWIRTSCHAFTUNG, KONSTANZ
Pumpage at New Orleans, W74-04676 5D	RENSSELAER POLYTECHNIC INST., TROY, N.Y. Mass Spectrometry and Inhomogeneous Ion	(WEST GERMANY). ABTEILUNG MAX AUERBACH-INSTITUT. The Relation Between Phytoplankton and
PERMUTIT CO., PARAMUS, N.J. Gravity Dewatering: Application to Paper Mill	Optics, W74-04475 5A	Phosphate in the Lake of Constance, (In German),
Wastes, W74-04533 5D	RIEKE, CARROL, MULLER ASSOCIATES,	W74-04637 5C
PLANNING COMMISSION, KARACHI	INC., HOPKINS, MINN. Trickling Filter-Activated Sludge Combinations for Domestic Wastewater Treatment,	STATE HYDRAULIC WORKS, ANKARA (TURKEY). DEPT. OF HYDROGRAPHIC MAPPING AND PHOTO GEOLOGY.
(PAKISTAN). WATER AND POWER SECTION. The Problem of Critical Discharge in Sediment Motion,	W74-04798 5D	Possible Application of Remote Sensing for Underground Water Exploration in Turkey,
W74-04801 2J	RIJKSWATERSTAAT-DELTADIENST, THE HAGUE (NETHERLANDS). COASTAL	W74-04568 7B
POLISH ACADEMY OF SCIENCES, WARSAW. INST. OF ECOLOGY.	RESEARCH DEPT. Theoretical Forms of Shorelines,	A Field Study of Langmuir Circulations,
Morphological Variation of Keratella cochlearis	W74-04336 2J	W74-04845 2H
(Gosse) (Rotatoria) in Several Masurian Lakes of Different Trophic Level, W74-04696 5C	Some Characteristics of the Dutch Coast, W74-04754 2J	STATE UNIV. OF NEW YORK, ALBANY. ATMOSPHERIC SCIENCES RESEARCH CENTER.
POLLUTION CONTROL ENGINEERING, INC., DOWNEY, CALIF. (ASSIGNEE).	RUTGERS - THE STATE UNIV., NEW BRUNSWICK, N.J. Effect of Porosity on Amount of Soil Water	Wave Interaction and Langmuir Circulations, W74-04844 2H
Apparatus for Treating Waste Fluids by Means of Dissolved Gases,	Transferred in a Freezing Silt, W74-04376 2C	STATE UNIV. OF NEW YORK, BUFFALO. DEPT. OF BIOLOGY.
W74-04719 5D	RUTGERS - THE STATE UNIV., NEW BRUNSWICK, N. J. DEPT. OF CIVIL	Detailed Time Variations in Mean Temperature and Heat Content of Some Madison Lakes, W74-04659 2H
PORTLAND STATE UNIV., OREG. Rates of Mass Wasting in the Ruby Range, Yukon Territory,	ENGINEERING. Wave Reflection and Transmission in Channels	STATE UNIV. OF NEW YORK, SYRACUSE.
W74-04371 2J	of Variable Section, W74-04614 8B	COLL. OF FORESTRY. Water in Wood, W74-04545 21
PUERTO RICO UNIV., MAYAGUEZ. DEPT. OF MARINE SCIENCES.	SANTOS AND HEILEMANN, MANAGUA (NICARAGUA).	STOCKHOLM UNIV. (SWEDEN). ASKO LAB.
Wave Period and the Swash Zone Energy Balance,	Prediction of the 1972 Managua, Nicaragua, Earthquake from Groundwater Changes, In-	The Use of Computer Simulations for Systems Ecological Studies in the Baltic,
W74-04622 2J	ferred Probability of Earthquakes in the City of	W74-04634 5B

WASHINGTON UNIV., SEATTLE. SCHOOL OF PUBLIC HEALTH AND COMMUNITY

SWECO, INC., LOS ANGELES, CALIF.	TEXAS UNIV., AUSTIN. DEPT. OF	UTRECHT RIJKSUNIVERSITEIT
(ASSIGNEE).	GEOLOGICAL SCIENCES.	(NETHERLANDS). INST. OF VETERINARY
Screening Aerator Concentrator,	Paleohydrology and Sedimentology of Lake Missoula Flooding in Eastern Washington,	PHARMACOLOGY AND BIOLOGICAL
W74-04712 5D	W74-04599 2E	TOXICOLOGY. A Preliminary Survey of the Possible Con-
SYRACUSE-ONONDAGA COUNTY PLANNING		tamination of Lake Nakuru in Kenya with
AGENCY, N.Y.	TOKYO UNIV. (JAPAN).	Some Metals and Chlorinated Hydrocarbon
Syracuse Metropolitan Area Comprehensive	Field Investigation Practices of Coastal Studies in Japan,	Pesticides,
Plan-Water and Sewer Plan and Services Allo- cation Plan.	W74-04625 2L	W74-04547 5C
W74-04507 5D		UZBEKSKII NAUCHNO-ISSLEDOVATELSKII
	TOKYO UNIV., (JAPAN). DEPT. OF CIVIL	INSTITUT SANITARII, GIGIENY I
TBILISSKII GOSUDARSTVENNYI	ENGINEERING. Suspended Sediment Due to Wave Action,	PROFZABOLEVANII, TASHKENT (USSR).
UNIVERSITET (USSR). Vertical Distribution of Zoobenthos of the	W74-04747 2J	Hygienic Efficiency of Measures for Protecting
Mountain River of Adzhar ASSR (In Russian).		Surface Waters in Uzbek SSR, (In Russian), W74-04838
W74-04818 2I	Rhythmic Pattern of Longshore Bars Related to	W74-04838 5F
	Sediment Characteristics, W74-04750 2J	VATTENBYGGNADSBYRAN LTD.,
TECHNISCHE UNIVERSITAET, DARMSTADT	W/4-04/30	STOCKHOLM (SWEDEN).
(WEST GERMANY). WASSER- UND ABWASSERFORS CHUNGS STELLE.	TOKYO UNIV. (JAPAN). OCEAN RESEARCH	Buoyancy Spread of Waste Water in Coastal
Electrolysis as a Purification Method for Ef-	INST.	Regions,
fluents of the Pulp and Paper Industry (Die	Ecological Characteristics of Go-No-Ike Lake, W74-04638 5C	W74-04630 5B
Elektrolyse als Reinigungsverfahren fuer Ab-	W74-04638 5C	VIRGIN ISLANDS DEPT. OF CONSERVATION
waesser der Papier- und Zellstoffindustrie),	TRACOR, INC., AUSTIN, TEX.	AND CULTURAL AFFAIRS, CHARLOTTE
W74-04542 5D	Statistical Analysis of Hydrograph Charac-	AMALIE, ST. THOMAS.
TECHNISCHE UNIVERSITAET, HANOVER	teristics for Small Urban Watersheds,	Effect of Light on Vulnerability of Heat-
(WEST GERMANY), INSTITUT FUER	W74-04459 2A	Stressed Sockeye Salmon to Predation by Coho Salmon,
GEMUESEBAU.	UKRAINSKII NAUCHNO-ISSLEDOVATELSKII	W74-04671 5C
Influence of Soil Moisture Conditions on	INSTITUT GIDROTEKHNIKI I MELIORATSII,	
Growth and Development of the Potato	KIEV (USSR).	VIRGINIA POLYTECHNIC INST. AND STATE
Solanum tuberosum L., W74-04687 3F	Calculation of the Concentration of the Biomass of Blue-Green Algae During Settling,	UNIV., BLACKSBURG. DEPT. OF BIOLOGY.
W/4-0400/	(In Russian),	Hybridization Between the Darters Percina
TECHNISCHE UNIVERSITAET, MUNICH	W74-04645 5C	crassa roanoka and Percina oxyrhyncha (Percidae, Etheostomatini), with Comments on
(WEST GERMANY). INSTITUT FUER		the Distribution of Percina crassa roanoka in
PFLANZENBAU UND	UNITED STATES LAKE SURVEY, DETROIT,	New River.
PFLANZENZUECHTUNG. Influences of Soil Density, Clay Silt and	MICH. Littoral Transport in the Great Lakes.	W74-04472 2E
Humus Content on Measurements of Soil	W74-04334 2J	
Water by Neutron Gauges, (In German),		VSESOYUZNYI INSTITUT NAUCHNO-
W74-04556 2G	Modification of Nearshore Currents by Coastal	TEKHNICHESKOI INFORMATSII PO SELSKOMU KHOZYAISTVU, MOSCOW
TETRA TECH ING BACABONA CALLE	Structures, W74-04341 8B	(USSR).
TETRA TECH, INC., PASADENA, CALIF. Shallow Water Waves: A Comparison of Theo-	W/4-04341	Problem of Pure Water in the USA, (In Rus-
ries and Experiments,	Currents at Harbor Beach, Michigan,	sian),
W74-04609 2E	W74-04342 5B	W74-04837 5G
	UNIVERSITY COLL., LONDON (ENGLAND).	WASHINGTON UNIV., SEATTLE.
TEXAS A AND M UNIV., COLLEGE STATION.	DEPT. OF CIVIL ENGINEERING.	Soil Development and Patterned Ground
DEPT. OF OCEANOGRAPHY AND METEOROLOGY.	The Relationship Between Wave Action and	Evolution in Beacon Valley Antarctica,
Hurricane Tide Prediction for New York Bay,	Beach Profile Characteristics,	W74-04372 2G
W74-04343 2L	W74-04331 2J	WARRINGTON ON THE COLUMN
	UNIVERSITY OF THE PANJAB, LAHORE	WASHINGTON UNIV., SEATTLE. COLL. OF FOREST RESOURCES.
TEXAS UNIV., AUSTIN. CENTER FOR RESEARCH IN WATER.	(PAKISTAN). DEPT. OF BOTANY.	Clarification Method of Polluted Water from
Optimal Operation of Multi-Reservoir Water	Effects of Flooding and Draining and Their Al-	Paper Mills With Combination of Beer Effluent
Resources Systems,	ternation on the Growth and Uptake of	(In Japanese),
W74-04314 4A	Nutrients by Rice (Oryza Sativa L., Indica Var. IR-8),	W74-04528 5D
MONTAG TIME A FIGURE CONTROL TOO	W74-04826 3F	WASHINGTON UNIV., SEATTLE. DEPT. OF
TEXAS UNIV., AUSTIN. CENTER FOR RESEARCH IN WATER RESOURCES.		CIVIL ENGINEERING.
Complete Listing of Program Described in Op-	UTAH CENTER FOR WATER RESOURCES RESEARCH, LOGAN.	Nutrient Income Change Related to Plankton
timal Operation of Multi-Reservoir Water	A Study of Water Institutions in Utah and	Algae,
Resources Systems,	Their Influence on the Planning, Developing,	W74-04318 5C
W74-04315 4A	and Managing of Water Resources,	WASHINGTON UNIV., SEATTLE. DEPT. OF
Tenth Year Annual Report, Center for	W74-04316 6E	OCEANOGRAPHY.
Research in Water Resources, University of	Social, Economic, Environmental, and Techni-	New Dimensions in Estuary Classification,
Texas at Austin.	cal Factors Influencing Water Reuse,	W74-04735 2L
W74-04595 9A	W74-04317 5D	WASHINGTON UNITY OF THE COURSE OF
TEXAS UNIV., AUSTIN. DEFENSE RESEARCH	IITAH IINIV GALT LAKE CITY BERT OF	WASHINGTON UNIV., SEATTLE. SCHOOL OF PUBLIC HEALTH AND COMMUNITY
LAB.	UTAH UNIV., SALT LAKE CITY. DEPT. OF BOTANY.	MEDICINE.
Investigation of Seiche Activity in West Coast	Water Quality Requirements of Aquatic In-	Relative Efficiency of Cell Cultures for Detec-
Harbors,	sects,	tion of Viruses,
W74-04744 2L	W74-04551 5C	W74-04767 5A

WATERLOOPKUNDIG LABORATORIUM, DELFT (NETHERLANDS).

WATERLOOPKUNDIG LABORATORIUM, DELFT (NETHERLANDS).
Hurricane Storm Surge Considered as a Resonance Phenomenon,
W74-04332 2L
Littoral Drift as Function of Waves and Cur-
rent, W74-04623
WEBER STATE COLL., OGDEN, UTAH. DEPT. OF CHEMISTRY.
Environmental Chemistry: Air and Water Pol- lution,
W74-04513 5B
WEIZMANN INST. OF SCIENCE, REHOVOTH (ISRAEL). ISOTOPE DEPT. Chemical Ecology: Evidence for Phosphate as the Only Factor Limiting Algal Growth in Lake Kinneret, W74-04685 5C
WESTINGHOUSE ELECTRIC CORP.,
PITTSBURGH, PA. (ASSIGNEE). Apparatus for Treating Industrial and Domestic
Waste Waters, W74-04707 5D
WISCONSIN UNIV., MADISON, COLL. OF
AGRICULTURAL AND LIFE SCIENCES. Paper Mill Sludge Disposal on Soils: Effects on the Yield and Mineral Nutrition of Oats (Avena satival.),
W74-04519 5E
WISCONSIN UNIV., MADISON. MATHEMATICS RESEARCH CENTER. SURF.
W74-04725 2J
WISCONSIN UNIV., MILWAUKEE. CENTER
FOR GREAT LAKES STUDIES. A Numerical Model for Determining Integral Primary Production and Its Application to Lake Michigan,
W74-04786 5C
WOODS HOLE OCEANOGRAPHIC INSTITUTION, MASS. Analytical Techniques for the Determination of Petroleum Contamination in Marine Organisms, W74-04594 5A
A Bacteriological Pressure-Retaining Deep-Sea Sampler and Culture Vessel,
W74-04773 5A
WOODWARD-LUNDGREN AND ASSOCIATES, OAKLAND, CALIF. Thaw Consolidation of Alaskan Silts and
Granular Soils, W74-04379 2C
Sample Disturbance and Thaw Consolidation of a Deep Sand Permafrost,
W74-04387 2C
WORLD HEALTH ORGANIZATION, DAR ES SALAAM (TANZANIA). EAST AFRICAN AEDES RESEARCH UNIT.
Aedes aegypti and Aedes simpsoni Breeding in Coral Rock Holes on the Coast of Tanzania,
W74-04697 2I

ACCESSION NUMBER INDEX

11/24 04201	27	W74-04379	2C	W74-04457	5D	W74-04535	5D
W74-04301	2L		2C	W74-04458	5A	W74-04536	5B
W74-04302	5D	W74-04380				W74-04537	5D
W74-04303	5D	W74-04381	2C	W74-04459	2A		
W74-04304	2A	W74-04382	2C	W74-04460	4B	W74-04538	5D
W74-04305	2E	W74-04383	2C	W74-04461	3B	W74-04539	21
W74-04306	21	W74-04384	2C	W74-04462	4A	W74-04540	5D
W74-04307	2F	W74-04385	2C	W74-04463	6A	W74-04541	5D
W74-04308	2F	W74-04386	2C	W74-04464	5G	W74-04542	5D
W74-04309	5B	W74-04387	2C	W74-04465	5G	W74-04543	5D
W74-04310	2A	W74-04388	8D	W74-04466	4B	W74-04544	5D
W74-04311	6B	W74-04389	2C	W74-04467	2F	W74-04545	21
W74-04312	2K	W74-04390	2C	W74-04468	2F	W74-04546	5D
W74-04313	5A	W74-04391	2F	W74-04469	2F	W74-04547	5C
				W74-04470	2A	W74-04548	5D
W74-04314	4A	W74-04392	2C				5D
W74-04315	4A	W74-04393	2C	W74-04471	5B	W74-04549	
W74-04316	6E	W74-04394	2F	W74-04472	2E	W74-04550	5G
W74-04317	5D	W74-04395	2F	W74-04473	6E	W74-04551	5C
W74-04318	5C	W74-04396	2F	W74-04474	5C	W74-04552	5C
W74-04319	6B	W74-04397	2C	W74-04475	5A	W74-04553	5C
W74-04320	4A	W74-04398	2C	W74-04476	2E	W74-04554	5D
W74-04321	2L	W74-04399	2C	W74-04477	8B	W74-04555	5G
W74-04322	2L	W74-04400	2C	W74-04478	5B	W74-04556	2G
W74-04323	2E	W74-04401	2C	W74-04479	5E	W74-04557	5A
W74-04324	2J	W74-04402	2C	W74-04480	5E	W74-04558	5A
W74-04325	2C	W74-04403	7B	W74-04481	5B	W74-04559	5G
		W74-04404				W74-04560	3F
W74-04326	8B		8D	W74-04482	8B		3C
W74-04327	5B	W74-04405	5D	W74-04483	4C	W74-04561	
W74-04328	2J	W74-04406	2C	W74-04484	2K	W74-04562	5D
W74-04329	2L	W74-04407	2C	W74-04485	5A	W74-04563	4B
W74-04330	2E	W74-04408	2C	W74-04486	21	W74-04564	3F
W74-04331	2Ј	W74-04409	4C	W74-04487	21	W74-04565	3F
W74-04332	2L	W74-04410	8D	W74-04488	5B	W74-04566	3F
W74-04333	5B	W74-04411	4C	W74-04489	2E	W74-04567	7B
W74-04334	2J	W74-04412	8D	W74-04490	5B	W74-04568	7B
W74-04335	2J	W74-04413	4C	W74-04491	5B	W74-04569	7B
W74-04336	2J	W74-04414	4C	W74-04492	2G	W74-04570	7B
W74-04337	2L	W74-04415	2C	W74-04493	2G	W74-04571	2C
						W74-04572	2C
W74-04338	8B	W74-04416	8D	W74-04494	2E		
W74-04339	2L	W74-04417	4C	W74-04495	4B	W74-04573	8B
W74-04340	8B	W74-04418	2C	W74-04496	2Н	W74-04574	4A
W74-04341	8B	W74-04419	5D	W74-04497	7B	W74-04575	2H
W74-04342	5B	W74-04420	4C	W74-04498	6E	W74-04576	2G
W74-04343	2L	W74-04421	8G	W74-04499	6D	W74-04577	2E
W74-04344	2L	W74-04422	4C	W74-04500	6B	W74-04578	2A
W74-04345	2L	W74-04423	8D	W74-04501	6B	W74-04579	5B
W74-04346	2C	W74-04424	8B	W74-04502	6B	W74-04580	3F
W74-04347	2C	W74-04425	21	W74-04503	5G	W74-04581	4D
W74-04348	2C	W74-04426	21	W74-04504	5G	W74-04582	8A
						W74-04583	5G
W74-04349	2C	W74-04427	2.1	W74-04505	6D		
W74-04350	2C	W74-04428	2.J	W74-04506	5D	W74-04584	7B
W74-04351	2C	W74-04429	2.J	W74-04507	5D	W74-04585	2J
W74-04352	2C	W74-04430	23	W74-04508	5D	W74-04586	4B
W74-04353	2C	W74-04431	2J	W74-04509	2B	W74-04587	2J
W74-04354	2C	W74-04432	2J	W74-04510	4B	W74-04588	8B
W74-04355	2C	W74-04433	2J	W74-04511	3D	W74-04589	8B
W74-04356	2C	W74-04434		W74-04512	5D	W74-04590	2G
W74-04357	2C	W74-04435	21	W74-04513	5B	W74-04591	23
W74-04358	2C	W74-04436	2.1	W74-04514		W74-04592	5E
		W74-04437	21	W74-04515	5D	W74-04593	2K
W74-04359 W74-04360	2C	W74-04438	21	W74-04516	5A	W74-04594	5A
	2C			W74-04516	5D	W74-04595	9A
W74-04361	2C	W74-04439					
W74-04362	2C	W74-04440		W74-04518		W74-04596	4B
W74-04363	2C	W74-04441	5B	W74-04519		W74-04597	2A
W74-04364	2C	W74-04442		W74-04520		W74-04598	4B
W74-04365	2C	W74-04443	5B	W74-04521	5D	W74-04599	2E
W74-04366	2C	W74-04444		W74-04522		W74-04600	5B
W74-04367	2C	W74-04445	5D	W74-04523	5C	W74-04601	2C
W74-04368	2C	W74-04446	5A	W74-04524	5D	W74-04602	4B
W74-04369	2C	W74-04447		W74-04525		W74-04603	8B
W74-04370	2C	W74-04448		W74-04526		W74-04604	
W74-04371	2J	W74-04449		W74-04527		W74-04605	
W74-04372	2G	W74-04450		W74-04528		W74-04606	
W74-04372	2C	W74-04451	5B	W74-04529		W74-04607	2E
						W74-04608	
W74-04374	2C	W74-04452		W74-04530			
W74-04375	2C	W74-04453		W74-04531		W74-04609	
W74-04376	2C	W74-04454		W74-04532		W74-04610	
W74-04377	2C	W74-04455		W74-04533		W74-04611	
W74-04378	2C	W74-04456	5B	W74-04534	5D	W74-04612	2E

W74-04613

W74-04613	2E	W74-04692	5G	W74-04771	5B
W74-04614	8B	W74-04693	4A	W74-04772	7C
W74-04615	2J	W74-04694	4A	W74-04773	5A
W74-04616	2L	W74-04695	2H	W74-04774	2J
W74-04617	2.5	W74-04696	5C	W74-04775	5B
W74-04618	23	W74-04697	21	W74-04776	5A
W74-04619	2J	W74-04698	21	W74-04777	5A
W74-04620	2J	W74-04699	21	W74-04778	5A
W74-04621	2J	W74-04700	21	W74-04779	5C
W74-04622	2.J	W74-04701	5A	W74-04780	5C
W74-04623	2J	W74-04702	81	W74-04781	5C
W74-04624	2J	W74-04703	21	W74-04782	5B
W74-04625	2L	W74-04704	5D	W74-04783	5B
W74-04626	8A	W74-04705	5G	W74-04784 W74-04785	5A
W74-04627 W74-04628	2L 5B	W74-04706 W74-04707	5F 5D	W74-04786	5B 5C
W74-04629	2L	W74-04708	5D	W74-04787	5C
W74-04630	5B	W74-04709	5D	W74-04788	5A
W74-04631	2L	W74-04710	3A	W74-04789	5C
W74-04632	5D	W74-04711	8B	W74-04790	5C
W74-04633	5A	W74-04712	5D	W74-04791	5A
W74-04634	5B	W74-04713	5G	W74-04792	2H
W74-04635	5C	W74-04714	5D	W74-04793	2C
W74-04636	2H	W74-04715	8I	W74-04794	2E
W74-04637	5C	W74-04716	5D	W74-04795	2D
W74-04638	5C	W74-04717	5D	W74-04796	2E
W74-04639	2Ј	W74-04718	5G	W74-04797	8I
W74-04640	3F	W74-04719	5D	W74-04798	5D
W74-04641	4A	W74-04720	3A	W74-04799	8B
W74-04642	4C	W74-04721	2L	W74-04800	2J
W74-04643	2H	W74-04722	2J	W74-04801	2J
W74-04644	5C	W74-04723	2E	W74-04802	2C
W74-04645	5C	W74-04724	2L	W74-04803	2C
W74-04646	2H	W74-04725	2J	W74-04804	5B
W74-04647	2H	W74-04726	2L	W74-04805	2J
W74-04648	5C	W74-04727	2.5	W74-04806	4A
W74-04649	2I.	W74-04728	2J	W74-04807	4A
W74-04650	81	W74-04729	2E	W74-04808	4B
W74-04651	2G	W74-04730	2L	W74-04809	2G
W74-04652	5B	W74-04731	2L	W74-04810	3D
W74-04653	3F	W74-04732	2L	W74-04811	4A
W74-04654	21	W74-04733	2G	W74-04812	3F
W74-04655	3F	W74-04734	2J	W74-04813	2L
W74-04656	8C	W74-04735	2L	W74-04814	5C
W74-04657	5B	W74-04736	2J	W74-04815	5C
W74-04658	2K	W74-04737	2J	W74-04816	2H
W74-04659	2H	W74-04738	2J	W74-04817	2H
W74-04660 W74-04661	5C 5C	W74-04739	2J	W74-04818 W74-04819	21
W74-04662	5B	W74-04740 W74-04741	2L 2L	W74-04819	5C 4A
W74-04663	5C	W74-04741	2L	W74-04821	3F
W74-04664	8B	W74-04742	2L	W74-04822	3F
W74-04665	2H	W74-04744	2L	W74-04823	3F
W74-04666	5C	W74-04745	2L	W74-04824	3F
W74-04667	8B	W74-04746	2L	W74-04825	3F
W74-04668	5B	W74-04747	2J	W74-04826	3F
W74-04669	5G	W74-04748	2L	W74-04827	3F
W74-04670	5C	W74-04749	2L	W74-04828	3F
W74-04671	5C	W74-04750	2J	W74-04829	3F
W74-04672	2E	W74-04751	2J	W74-04830	3F
W74-04673	2E	W74-04752	2J	W74-04831	3F
W74-04674	5B	W74-04753	2.J	W74-04832	3F
W74-04675	2E	W74-04754	2J	W74-04833	3F
W74-04676	5D	W74-04755	2Ј	W74-04834	3F
W74-04677	5D	W74-04756	2J	W74-04835	5A
W74-04678	2H	W74-04757	2J	W74-04836	5D
W74-04679	21	W74-04758	2L	W74-04837	5G
W74-04680	5C	W74-04759	2L	W74-04838	5F
W74-04681	5C	W74-04760	8B	W74-04839	5B
W74-04682	21	W74-04761	2L	W74-04840	21
W74-04683	21	W74-04762	2L	W74-04841	2J
W74-04684	5A	W74-04763	2L	W74-04842	2E
W74-04685	5C	W74-04764	5C	W74-04843	7C
W74-04686	4A	W74-04765	8B	W74-04844	2H
W74-04687	3F	W74-04766	4B	W74-04845	2H
W74-04688	5C	W74-04767	5A	W74-04846	2J
W74-04689	2H	W74-04768	5A	W74-04847	5G
W74-04690	3F	W74-04769	5A	W74-04848	9D
W74-04691	3F	W74-04770	5A	W74-04849	5B

W74-04850 5B

ABSTRACT SOURCES

Source		Accession Number	Total
A.	Centers of Competence		
	AEC Oak Ridge National Laboratory, Nuclear Radiation and Safety	W74-04441 04457	17
	Battelle Memorial Institute, Methods for Chemical and Biological Identification of Pollutants	W74-04767 04791	25
	Cornell University, Policy Models for Water Resources Systems	W74-04320 04561 04566	7
	Institute of Paper Chemistry, Water Pollution from Pulp and Paper Industry	W74-04512 04546 04632 04633	37
	University of North Carolina, Metropolitan Water Resources Planning and Management	W74-04319 04498 04511	15
	U.S. Geological Survey, Hydrology	W74-04346 04424 04466 04485 04488 04497 04567 04606 04792 04809 04842 04846	173
	Vanderbilt University, Thermal Pollution	04848 W74-04656 04675 04764 04766	23
В.	State Water Resources Research Institutes		
	Alabama Water Resources Research Institute	W74-04303, 04560	2
	Alaska Institute for Water Research	W74-04304	1
	Arkansas Water Resources Research Center	W74-04305	1
	California Water Resources Center	W74-04306	1
	District of Columbia Water Resources Research Center	W74-04810	1
	Georgia Environmental Resources Center	W74-04307	1
	Hawaii Water Resources Research Center	W74-04308 04309	2
	Kentucky Water Resources Research Institute	W74-04310 04311	2
	Massachusetts Water Resources Research Center	W74-04462 - 04463	2
	North Carolina Water Resources Research Institute	W74-04312	1
	Tennessee Water Resources Research Center	W74-04313	1
	Texas Water Resources Institute	W74-04314 - 04315	2
,	Utah Center for Water Resources Research	W74-04316 04317	2
	Washington Water Research Center	W74-04318	1

ABSTRACT SOURCES

So	arce	Accession Number	Total
c.	Other		
	BioSciences Information Service	W74-04486 04487 04547	88
		04556 04558 04634 04655	
		04678 04703 04733	
		04811 04840 04847	
		04849 04850	
	Environmental Protection Agency	W74-04464 04465 04548 04555 04559 04676 04677	13
	Ocean Engineering Information Service	W74-04321 04345 04425 04440 04607 04631 04721 04732	109
		04734 04763 04841	
	Ocean Engineering Information Service (Patents)	W74-04704 04720	17
	Office of Water Resources Research	W74-04301 04302 04458 04461	6

CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.

Subject Fields

NATURE OF WATER

2 WATER CYCLE

WATER SUPPLY AUGMENTATION AND CONSERVATION

WATER QUANTITY MANAGEMENT 4 AND CONTROL

WATER QUALITY MANAGEMENT AND PROTECTION

WATER RESOURCES PLANNING

RESOURCES DATA

ENGINEERING WORKS 8

MANPOWER, GRANTS, AND **FACILITIES**

SCIENTIFIC AND TECHNICAL 10 **INFORMATION**



POSTAGE AND FEES PAID DEPARTMENT OF COMMERCE U.S.

COM 211

EGUAL OPPORTUNITY EMPLOYER

AN

SWRA XEROX UNIVERSITY MICROFILMS SERIALS DEPARTMENT 300 NORTH ZEEB ROAD ANN ARBOR MI 48106

INDEXES

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

National Technical Information Service Springfield, Ve. 22151 U.S. DEPARTMENT OF COMMERCE

PRINTED MATTER OFFICIAL BUSINESS

001

